ASTM BULLETIN

260 SOUTH BROAD STREET PHILADELPHIA, PA.

"Promotion of Knowledge of Materials of Engineering and Standardization of Specifications and Methods of Testing"

TELEPHONE—PENnypacker 3545 CABLE ADDRESS—TESTING

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Forty-first Annual Meeting High Spots

Standardization and Research Work Advanced

EVEN though there is no single factor by which to judge the significance and success of the annual meetings, there are certain items which may serve as a barometer of activity. Although the some 60 standing committees of the Society have constantly a great amount of work in keeping their standards in line with commercial practice, the development of standardized requirements for materials not previously covered is one indication of progress. It is significant therefore that the number of new specifications and tests to be published for the first time as tentative as the result of actions at the annual meeting is greater than for any other year, the total being 68. This figure compares with some 51 in 1937 and 48 in 1936.

Attendance at the meeting as a criterion of interest must be evaluated in the light of industrial conditions, location of the meeting, and other factors. The registered attendance of 1138 is a new high for Atlantic City and exceeds that of any other meeting excepting the 1937 meeting in New York City with an attendance of 1523. In general the 17 sessions devoted to papers and reports were well attended. Of the registration, 819 were members, 178 committee members not affiliated with the Society personally or as official representatives, and 141 visitors. Corresponding figures for 1936 (Atlantic City) are 757, 143, and 231. Ladies' registration totaled 271.

In practically all cases there was an excellent turn-out at the more than 235 committee meetings scheduled. This number of committee meetings exceeds that for any other time despite the fact that in general the committees try to perfect as much as possible of their work at the Spring Group Meetings or other meetings held in the early part of the year.

Over 100 technical papers and reports were presented. Certain of the technical features were of outstanding interest, including the Symposium on Impact Testing. There was considerable emphasis on effect of temperature on metals, radiographic testing, and cement and concrete.

PRESIDENTIAL ADDRESS

In his presidential address given at the formal opening session on Tuesday, the President, Doctor A. E. White, discussed "Organized Research," pointing out the importance of A.S.T.M. activities in this field on methods of testing and on the properties of materials and discussed research activities under general groups including individuals, corporations, associations, testing laboratories, Government bureaus, councils, foundations, societies, research institutes and colleges and universities. He said, "Research is one of the keystones upon which further world progress depends. It enters into the field of agriculture, communication, transportation, public health, energy, and the production of industrial prod-

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ucts. There is a definite interlocking of all of these groups. Each one is dependent for its prosperity and advancement upon the others. All must look to research as one of their foundation stones.

"The 'handwriting on the wall' is clear. The findings of research are needed for our continued progress and prosperity. No field is an exception. Sponsorship of research, therefore, must and will be continued at an ever accelerating rate. Such sponsorship must be in the fields of both fundamental and applied research. Every encouragement, therefore, should be given to those individuals and agencies engaged in research so that, through their achievements, research may contribute its share in restoring prosperity, improving standards of living, and adding to our store of cultural values."

MARBURG LECTURE ON THE TORSION TEST

A splendid audience heard the Marburg Lecture on "The Torsion Test," delivered by Dr. Albert Sauveur. He reviewed briefly the development of the tension test mentioning that faith in it was deeply rooted. He pointed out that "all we can reasonably ask of a testing method is that it enlighten us as to the properties of the materials tested, so that we may use them more intelligently, with greater economy and greater safety. If the torsion test fulfills these requirements it is entitled to our consideration." The aim of the investigations covered in the paper was to discover whether the torsion test was a simple and satisfactory method of ascertaining the properties of metals. In general solid bars were used in the tests.

Doctor Sauveur described briefly the machine which was developed at Harvard mentioning that very slow and quite rapid speeds could be obtained with it. Considerable data were included on various materials tested. Some of the tests were conducted in the blue heat range and Doctor Sauveur also covered work on reverse twisting. He feels that useful information could be obtained from a closer study of the significance of the hysteresis loops obtained. Close relations must exist between them and the physical properties of metals which are not readily brought out by the tension test. Reverse twisting seems to afford a simple method of studying the effect of cold work deformation at room and at higher temperatures, including the blue heat range.

Some work was done on single crystals and yielding by "steps" or "jumps" was noted. Similar tests of a bar of pure metal, polycrystalline in nature, indicated a marked yield point, but with "steps" very much less pronounced. Doctor Sauveur said: "Speculating, it might be conceived that twisting in the plastic range takes place by block slipping and that in the case of a polycrystalline metal and also in single crystals fragmented by deformation the slipping blocks are so small that the individual steps are not recorded on the curve."

In conclusion Doctor Sauveur claimed for the torsion test (1) simplicity of manipulation, (2) low cost of torsion testing machine, (3) low cost of preparation of test bars, (4) adaptability to high temperature testing, (5) possibility of reverse twisting, (6) possible adaptability to determination of creep, (7) possibility of testing at will under constant speed of twisting or under constant speed of loading, (8) determination of properties unrevealed by the tensile test.

DUDLEY MEDAL AWARDED

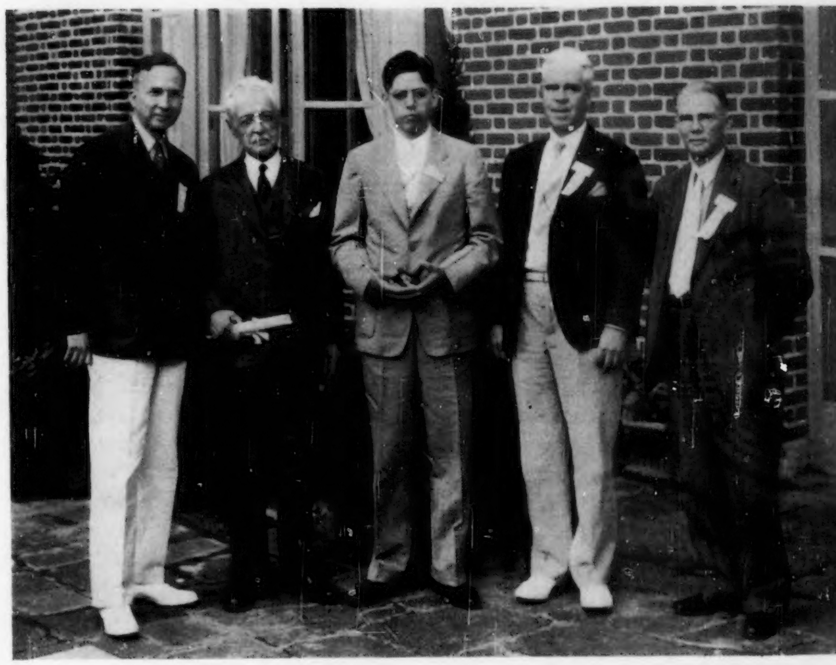
Robert H. Heyer, Junior Metallurgist, Research Laboratories, The American Rolling Mill Co., was awarded the Charles B. Dudley Medal for 1938. This medal, which commemorates the name of the first President of the American Society for Testing Materials, is awarded to the author or authors of the paper presented at the preceding annual meeting which is of outstanding merit and constitutes an original contribution on research in engineering materials.

Mr. Heyer's paper, entitled "Analysis of the Brinell Hardness Test," was based on a thesis which he presented to the Faculty of Purdue University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy, June, 1938. The paper proposed a method for expressing a shear yield strength which bears a definite relationship to tensile or compressive yield strengths and gives an explanation for the differences commonly observed in the surface contours of Brinell impressions. Mr. Heyer, by means of a split hardness test specimen, studied differences in the nature of the plastic deformation below the surfaces of test impressions and established relations of the depth of the visible plastic deformation, rise of metal above the original surface, and the Meyer n coefficient.

Mr. Heyer is a graduate of the University of Minnesota, 1929, with a degree of B.S. in Mechanical Engineering. After services at the Crucible Steel Co. of America, Halcomb plant, Syracuse, N. Y., he returned to the University of Minnesota, 1930, to receive his M.S., majoring in physical metallurgy. Then until 1937 he was an instructor of metallurgy at Purdue University, joining the staff of the American Rolling Mill Co. in June of that year.

SUMMARY OF ACTIONS TAKEN AT ANNUAL MEETING AFFECTING STANDARDS AND TENTATIVE STANDARDS

	Existing Tentative Standards Adopted as Standard	Standards in Which Revisions Will Be Adopted	New Tentative Standards	Proposed Revisions of Existing Standards Accepted as Tentative	Existing Tentative Standards Revised	Standards and Tentative Standards Withdrawn or Replaced	Total Standards Adopted	Total Tentative Standards
A. Ferrous Metals—Steel, Cast Iron, Wrought Iron, Alloys, etc.	11	6	4	8	5	..	124	49
B. Non-Ferrous Metals—Copper, Zinc, Lead, Aluminum, Alloys, etc.	2	9	5	2	14	3	56	50
C. Cement, Lime, Gypsum, Concrete and Clay Products	3	6	9	10	6	4	88	44
D. Paints, Petroleum Products, Coal, Textiles, Rubber, Soap, etc.	16	13	53	17	33	29	232	185
E. Miscellaneous Subjects, Testing, etc.	..	..	..	..	1	..	14	13
Total	32	34	71	37	59	36	514	341



From left to right: C. L. Warwick, Secretary-Treasurer; Albert Sauveur, Marburg Lecturer; R. H. Heyer, Dudley Medalist; President A. E. White; President-elect T. G. Delbridge

GOLF TOURNAMENT

Perhaps the most interesting news item resulting from the Twenty-first Annual Golf Tournament, held at the Seaview Golf Club on June 30, is that the A.S.T.M. Championship Cup, donated by Committee A-1 on Steel in 1919, and held by several of the Society golfers for a year or more since that time, is no longer in circulation. The cup was won permanently by C. M. Loeb, Jr., who, by persistent sharp-shooting has had the low gross score for the past three years. His gross scores have been 75, 71, and this year, 72.

The tournament was in the charge of a committee consisting of Messrs. J. G. Bragg, *chairman,* G. H. Clamer and Harold Farmer. In addition to his cup, Mr. Loeb also won eight golf balls. Several other prizes were awarded—W. B. Price, for second low gross (four balls); V. A. Crosby, low net (eight balls); W. D. Kerlin, second low net (four balls); Harold Farmer, kickers handicap (golf bag); and R. E. Arnold, low score for odd-numbered holes (golfer's umbrella).

The gross scores ranged from Mr. Loeb's 72 to 113 (permission to use name refused). The high score in last year's tournament was 116; the maker finished under 110 this year which indicates a tightening of permissible tolerances.

PHOTOGRAPHIC EXHIBIT

There was considerable interest in the first photographic exhibit arranged by Messrs. Skinker, Herriott, and Hiers, and for which quite a number of individuals and companies submitted prints. There were upwards of 75 photographs on display covering many phases of testing, testing instruments and the like. For this year the theme of the display was limited to "testing." Ribbons were awarded in the amateur class and J. P. Eldredge, Leeds & Northrup Co., Philadelphia, took first and third prizes with his pictures entitled "One Ohm Absolute" and "pH Measurement." The second prize was awarded to one of three photographs displayed by Mr. Isenberger of St. John's X-ray Service, Inc., showing a portable X-ray outfit. Honorable mention was given to three photographs, one entitled "Broken Glass" submitted by N. L. Hettinger, Willson Products, Inc., and K. L. Herman and R. C. Stratton of The Travellers Insurance Co. won honorable mention for two of their pictures entitled "Titration" and "Air Sampling."

Some of the prize-winning photographs are shown in another portion of this BULLETIN and additional photographs will be used from time to time.

It is planned that another photographic display and competition will be held at the 1939 annual meeting in Atlantic City and in view of the interest expressed it is expected that the second will be equally interesting. It is expected that a special committee will be appointed to make the arrangements and handle the various details for the 1939 display and further announcement will be made.

STANDARD SPECIFICATIONS AND TESTS

The accompanying table arranged according to the general materials fields involved summarizes the large number of recommendations which were acted upon at the annual meeting. As indicated previously, the number of new tentative standards accepted for publication was considerably higher than for any other meeting. It will be noted that there were approved for submission to letter ballot of the Society for adoption as standard a number of existing tentative specifications and tests and also the adoption of a number of revisions published previously. In a separate mailing there is being sent to each member a letter ballot covering these actions involving the adoption of new standards or changes in existing ones, this ballot being accompanied as customary by the Summary of Proceedings which gives detailed information on matters covered in the ballot.

A list of new tentative standards appears on another page of this BULLETIN and there is also an article listing the standards which were withdrawn for various reasons, in many cases because of replacement or consolidation with other standards.

It will be noted from the table that, assuming a favorable vote on the actions being submitted to Society letter ballot, there will have been issued 855 standard and tentative specifications and tests.

SYMPOSIUM ON IMPACT TESTING

Of outstanding interest to a large number of technologists was the Symposium on Impact Testing, comprising eight technical papers with extensive discussion. This symposium was developed by W. W. Werring, Bell Telephone Laboratories, Inc., Chairman of the Section on Impact Testing of Committee E-1 on Methods of Testing; and Professor M. F. Sayre of Union College, representing the Welding Research Committee of the Engineering Foundation. This committee is sponsored jointly by the American Welding Society and the American Institute of Electrical Engineers.

In the first part, present fields of commercial use for the impact test were stressed, with particular reference to places where the impact test gives necessary information not supplied by static tests. In the latter part, the basic theory underlying impact testing was under discussion.

Robert Burns and W. W. Werring, Bell Telephone Laboratories, Inc., reported on the success obtained in reducing the breakage of telephone apparatus, particularly the hand sets, by use of plastics where quality was controlled by impact drop tests on the apparatus parts themselves and on specially molded test specimens. Success in this testing, however, depended upon careful control of the temperature and humidity at which the specimens were tested, and also upon the use of a combination of several types of test.

G. C. Riegel and F. F. Vaughn, Caterpillar Tractor Co., reported upon the success which their company had had in reducing the failures of gears, caterpillar tracks and other parts over a period of years through the development of steels of progressively higher and higher impact strength values, the shape of the parts themselves and the ultimate strength, hardness, and ductility of the material used being retained essentially unchanged. The impact test was here used not only as a measure of the resistance of the metal to sudden blows, but also to measure the likelihood of brittle failure under normal static loading at notches or points of stress concentration. To check on possibilities of added brittleness under severe winter conditions, occasional tests at very low temperatures are made.

The use of methods of impact testing, each one devised to meet specific needs, in cases where the ordinary standard methods of impact testing could not be used, was urged by Sam Tour of Lucius Pitkin, Inc. He described a number of cases where this has been done successfully.

W. H. Bruckner described work done at the Naval Research Laboratory at Annapolis on studies of weldability of steels, in which small test coupons of various steels were given heat treatments simulating those which occur naturally to the steel immediately adjacent to the line where a weld is being deposited. These coupons were then tested in impact and compared in properties with similar coupons not heat treated.

The paper by D. J. McAdam, Jr., and R. W. Clyne on "The Theory of Impact Testing: Influence of Temperature, Velocity of Deformation and Form and Size of Specimen on Work of Deformation" emphasized the fact that notch impact testing was primarily a method of testing for potential brittleness in a material under all types of service rather than a method of testing for resistance to effect of sudden blows, the notch acting to intensify any tendency toward brittleness which might be present in the same way as would lowered temperature or, to a lesser degree, higher velocity of blow.

A paper received from Prof. N. Davidenkov of Leningrad, U.S.S.R., emphasized that it was often much more important to determine how large a change in conditions would be required to produce sudden increase in brittleness, than it was to know what the ductility of energy absorption was numerically under the test conditions themselves. As a quantitative "brittleness factor" he recommended the use of a ratio obtained by subtracting the temperature at which cold brittleness appears in standard impact tests, from room temperature, and dividing by the room temperature in degrees absolute. This gives an equation identical in form to the familiar Carnot cycle equation, but applied to an altogether different purpose.

A new apparatus by which the momentary stresses and strains could be measured in a test bar of steel while being suddenly broken in tension was described by D. S. Clark and G. Dätwyler, California Institute of Technology, and some experimental results were given, showing that the strength is generally greater than under slow loading, with wide variations in the ratio between the energies required to produce rupture under slow and fast loading.

A critical review of literature on impact tests of welds was summarized by W. Spraragen and G. E. Claussen of the Welding Research Committee. S. L. Hoyt gave an important summary of impact testing developments emphasizing particularly our increasing knowledge of the subject.

RADIOGRAPHY SESSION

In the session devoted to radiography there were four technical papers in addition to the report of Committee E-7 on Radiographic Testing. The opening paper by Doctor Lester discussed radiography in industry. He pointed out its wide usage and that even with some misunderstanding and incorrect applications in the work, especially in the early years, it has become so important in industry that A.S.T.M., the first industrial Society to recognize it, has set up a new standing committee devoted to its interests. He pointed out that radiography is not merely a method of testing. It is a device that makes possible the utilization of more economical methods of fabrication of highly responsible structures, but more important than that, it fills an essential need in industrial evolution in that it makes possible the reasonable assurance of dependable service in the structural units of our modern mechanized society. Up to now, radiography remains as the most generally practical method of non-destructive testing. This paper will appear in a later BULLETIN.

Dr. H. E. Seemann of the Kodak Research Laboratories discussed the effect of secondary radiation upon the quality of a radiograph. He also covered the principles of measurement and results of experiments to determine the amount of secondary radiation in the radiography of common industrial materials. Thicknesses were limited to those which can be conveniently radiographed without fluorescent intensifying screens. The principal conclusions to be drawn are: (1) That lead screens may remove nearly one-half of the secondary radiation recorded when no screens are used, and (2)

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A. T. Goldbeck

Dean Harvey

G. E. Hopkins

Allen Rogers

J. J. Shuman

NEW OFFICERS

THE recent election of officers, as announced at the annual meeting by the tellers resulted in the unanimous election of T. G. Delbridge as President (1938-1939), W. M. Barr as Vice-President (1938-1940) and the following as members of the Executive Committee (1938-1940): A. T. Goldbeck, Dean Harvey, G. E. Hopkins, Allen Rogers, and J. J. Shuman.

PRESIDENT

T. G. Delbridge, the new President, is Manager, Research and Development Dept., The Atlantic Refining Co., Philadelphia, Pa. A native of Batavia, N. Y., where his early public school education was obtained, Doctor Delbridge was graduated with an A.B. degree from Union College in Schenectady, N. Y. He specialized in Greek, Latin, and Chemistry and was elected to Phi Beta Kappa and Sigma Xi. In 1907 he obtained his Ph.D. from Cornell University, where he was an instructor in chemistry from 1904 to 1909. He became chemist for The Atlantic Refining Co. in 1909 and in 1914 was assistant superintendent; in 1918, chief chemist; in 1922 assistant plant manager; and in 1923 became Manager, Research and Development Department, the position he now occupies.

While the research activities under his supervision have embraced a wide field of petroleum investigation, he has contributed especially to developments in distillation methods, solvent refining (the nitrobenzene process), wax manufacturing and methods of testing.

Doctor Delbridge was a member of the A.S.T.M. Executive Committee, 1923 to 1925 and Vice-President, 1936 to 1938. He has been Vice-Chairman of Committee D-2 on Petroleum Products and Lubricants since 1930. He served two terms as a member of the Society's Committee E-6 on Papers and Publications and also for six years was a member of Committee on E-10 on Standards. He is one of the representatives of the Society on the Sectional Committee on Petroleum Products and Lubricants and on the Sectional Committee on Valid Certification. He is a member of the American Chemical Society, Franklin Institute, American Petroleum Institute, and the British Institution of Petroleum Technologists.

VICE-PRESIDENT

W. M. Barr, newly elected Vice-President, is Chief Chemical and Metallurgical Engineer, Union Pacific Railroad Co., Omaha, Neb. Born in West Union, Iowa, Doctor Barr was graduated from the University of Iowa, 1902, B.Sc.; Grinnell College, 1904, M.A.; and University of Pennsylvania, 1908, Ph.D. He was elected to Sigma Xi in 1902. Following his university work he was chemist with the Mallinckrodt Chemical Works; Professor of Engineering Chemistry, Iowa State College; then Manufacturing Research Chemist with the Mallinckrodt Chemical Works and later became Manager of the Eastern Works of this company. In 1916 he entered the employ of the Union Pacific Railroad Co. as Consulting Chemist and became Chief Chemical and Metallurgical Engineer, in which position he has charge of laboratories, water supply, inspection and tests of materials, and specifications for materials.

Doctor Barr has written papers on water treatment, engine failures and materials, use of alloy steels in locomotives, etc. He has been active in the work of Committee A-1 on Steel for a number of years, chairman of the subcommittee on forgings and is a member of Committees A-2 on Wrought Iron and D-1 on Paint, Varnish, Lacquer, and Related Products. He was a member of the A.S.T.M. Executive Committee, 1934 to 1936. His other Society affiliations include the American Chemical Society, American Institute of Chemical Engineers, American Railway Engineering Association and Engineers' Club of Omaha.

MEMBERS OF EXECUTIVE COMMITTEE

A. T. Goldbeck, Engineering Director, National Crushed Stone, Assn., Inc., Washington, D. C., following his graduation from the University of Pennsylvania in 1906, where he received the degree of B.S. in Civil Engineering and later received his C.E. degree, was instructor at the University and also at Lafayette College and then became Engineer of Tests for the Office of Public Roads in Washington. He was Testing Engineer for the City of Philadelphia from 1913 to 1915, and then returned to the reorganized Bureau of Public Roads as engineer of tests in charge of non-bituminous materials and highway engineering investigations. Later he became Chief of the Division of Tests and held this position until he became Engineering Director of the National Crushed Stone Assn., during the latter part of 1925. Mr. Goldbeck has participated actively in the work of a number of A.S.T.M. committees, particularly C-1 on Cement, D-4 on Road and Paving Materials and C-9 on Concrete and Concrete Aggregates. He formerly was secretary and later chairman of Committee C-9. His other society memberships include: American Concrete Institute, American Society of Civil Engineers, American Railway En-

gineering Assn., American Institute of Mining and Metallurgical Engineers, American Road Builders' Assn., and Association of Asphalt Paving Technologists.

Dean Harvey, Materials Engineer, Central Material and Process Engineering Dept., Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., is a graduate of Armour Institute of Technology, Chicago, in 1900, receiving his degree of E.E. In 1904 Mr. Harvey became connected with the Westinghouse Electric and Manufacturing Co., as electrical engineer on detail apparatus and switchboards. Since 1911 he has been materials engineer with the company on application of materials, preparation of material specifications and test methods, and standardization of materials. Mr. Harvey has been especially active in the work of Committee B-4 on Electrical Alloys of which he has been chairman for a number of years; D-9 on Electrical Insulating Materials and Committee D-13 on Textile Materials (chairman of the subcommittee on papers and program). He served two terms on the Society's Committee E-6 on Papers and Publications, 1929 to 1935, and was chairman of the Pittsburgh District Committee from 1934 to 1938. Mr. Harvey is a member of the American Institute of Electrical Engineers and is affiliated with several sectional committees sponsored by the American Standards Assn.

G. E. Hopkins, Technical Director, Bigelow-Sanford Carpet Co., Inc., Thompsonville, Conn., is a graduate of Massachusetts Institute of Technology, class of 1926, in Chemical Engineering. He was employed in studies of oil and dust explosions and chemical fire extinguishers by the Factory Mutual Fire Insurance Cos., June, 1926, to January, 1928, and was also affiliated with R. G. Knowland, Consulting Engineer. Until 1931 he was Chemical Engineer, Bigelow-Sanford Carpet Co., Inc., at which time he was appointed Technical Director of this company in charge of research and development. He has taken a leading part in the activities of Committee D-13 on Textile Materials, particularly in its work on wool, of which subcommittee he is chairman. He is also vice-chairman of Committee D-13. He is a member of the Committee on Chemistry of Wool sponsored by the American Association of Textile Chemists and Colorists, and is active in the work of the United States Institute for Textile Research. He is a member of the following organizations: American Institute of Chemical Engineers, American Association of Textile Chemists and Colorists, American Chemical Society, and American Association for the Advancement of Science.

Allen Rogers, Supervisor, Course in Industrial Chemical Engineering, Pratt Institute, Brooklyn, N. Y., received his degree of B.S. in Chemistry from the University of Maine in 1897; M.S. degree in 1900 and Ph.D. from the University of Pennsylvania in 1902. He was Senior Fellow and Instructor in Organic Chemistry, University of Pennsylvania, until 1904; Research Chemist, Oakes Manufacturing Co., for a year, and from 1905 to 1920 was in charge of Industrial Chemistry at Pratt Institute. He has been in his present position since 1920. During the World War he was a Major in the Chemical Warfare Service in charge of Industrial Relations. He has been awarded numerous patents in connection with leather, furs, inks, oils and paints. In the Society he has been especially concerned with the work of Committee D-1 on Paint, Varnish, Lacquer, and Related Products and its numerous subcommittees. He has been chairman of the committee since 1920. Doctor Rogers is the author of several textbooks in the field of industrial chemistry and tanning. In 1920 he was awarded the Grasselli Medal of the Society of Chemical Industry for his work on shark leather. He holds membership in the following: American Chemical Society, Society of Chemical Industry, American Institute of Chemical Engineers, American Institute of Chemists, American Leather Chemists Assn., Technical Association for the Fur Industry, and American Association for the Advancement of Science.

J. J. Shuman, Inspecting Engineer, Jones & Laughlin Steel Corp., Pittsburgh, Pa., was born in Lancaster County, Pa. He was graduated in 1890 from Northwestern University and became employed by the Illinois Steel Co., South Works, later being transferred to the Joliet Works. Then he became Assistant General Superintendent of the Newburgh Steel Works, Cleveland, and since June, 1900, has been with his present company. Mr. Shuman has been extremely active in the work of a large number of committees involving steel and steel products. He was a member during the War of the Metallurgical Advisory Committee, has been active for years in the work of the American Steel Manufacturers' Technical Committees, and took a leading part in the work involved in the Technical Committee for the Iron and Steel Code Authority. For many years he has been chairman of the A.S.T.M. Steel Committee's subgroup on commercial bar steels and active in other committee work, including Committee A-5 on Corrosion. Mr. Shuman took a leading part in the work of the Joint Committee on Phosphorus and Sulfur in Steel. He is a member of several sectional committees functioning under A.S.A. procedure and is a member of the A.S.T.M. Pittsburgh District Committee; also of the Society of Engineers of Western Pennsylvania.

Numerous Actions on Standards Referred to Letter Ballot

By action of the Forty-first Annual Meeting, 66 recommendations from the standing committees affecting standards and tentative standards were approved for submission to letter ballot of the Society membership. These recommendations comprise 32 tentative standards proposed for adoption as standards and the adoption as standard of revisions proposed in 34 existing standards. A complete list of the items to be voted upon appears in the letter ballot being sent in a separate mailing to the members. Detailed information concerning all matters referred to letter ballot is given in the committee reports issued in preprint form to the membership in advance of the meeting. The Summary of Proceedings accompanying the letter ballot contains a record of all actions taken at the annual meeting and also gives in full detail any changes in or additions to the standing committee recommendations as preprinted.

All members in good standing are urged to execute the ballot and vote on the matters on which they feel technically qualified to pass judgment.

Annual Meeting High Spots

(*Continued from page 4*)

that no important reduction in secondary radiation is possible by adjustment of the kilovoltage within the range it is necessary to use for a given subject.

A study undertaken to refine the accuracy and lower the cost of testing welds (and other objects of like importance) radiographically was discussed by Messrs. Doan and Shang-Shoa Young of Lehigh University. The authors pointed out that in testing welds radiographically for internal flaws, very sensitive methods must be used because the flaws are of small size. A formula had been developed to calculate exactly the minimum distance permissible from radiant source to recording film for certain registry in radiographic testing. Results obtained indicate that dependable registry may be obtained from the penumbral shadow and that the formula for this makes possible a calculation of the minimum distance.

In a paper on "A Study of Intensifying Screens for Gamma-Ray Radiography," Messrs. Briggs and Gezelius pointed out it has been known for many years that a reduction in exposure time can be obtained if materials which fluoresce upon exposure to the rays are kept in intimate contact with the film. Calcium tungstate has been found to be the most efficient intensifier for both X-rays and gamma-rays. However, tests made at the time the original studies on gamma-ray technique were conducted indicated that the calcium tungstate screens available at that time did not possess enough advantages, when compared to lead screens, to warrant their use. Since then there has been considerable improvement in the calcium tungstate screens. It was deemed advisable to study several commercial screens in an attempt to improve the technique now used. Six different sets of intensifying screens were obtained for the work. The authors concluded that calcium-tungstate intensifying screens show considerable variations among themselves. The sensitivity recorded by using them was inferior to that of the lead-foil screens. Also the longer the exposure the poorer the definition due to the fogging or clouding of the defects by the fluoroscopic effect retained by the screens.

FERROUS METALS (Including Corrosion)

Sessions of special interest to the ferrous metals fields, in addition to those on impact and radiography, included the eleventh, dealing with steel, ferro alloys and corrosion, the fourteenth on iron, and the tenth on effect of temperature and fatigue.

Committee A-1 on Steel offered new specifications for normalized quenched-and-tempered steel forgings and proposed the adoption as standard of seven existing specifications covering: structural nickel steel, seamless cold-drawn alloy-steel (4 to 6 per cent chromium) heat-exchanger and condenser tubes, still tubes, carbon-silicon-steel plates, chromium-manganese-silicon, and molybdenum-steel plates for boilers and other pressure vessels, and cold-rolled strip steel.

Professors Collins and Dolan, University of Illinois, reported on tests made to obtain information on the load-resisting properties of four low-alloy high-strength steels and one ordinary structural carbon steel when subjected to static, impact, and repeated loads. The results indicate that two of the low-alloy high-strength steels had considerably higher ratios of yield point to tensile strength than ordinary structural carbon steel and had about the same ductility as the latter. The chemical compositions for these two steels are as follows: (A) carbon, 0.08; manganese, 0.27; phosphorus, 1.45; sulfur, 0.020; silicon, 0.80; copper, 0.41;

Executive Committee Meeting, June 26, 1938, Atlantic City. Reading from left to right (clockwise)—Messrs. Goldbeck, Lundell, Fieldner, Shuman, Harvey, Hopkins, Mougey, Templin, Vice-President-elect Barr, Assistant Secretary Hess, President White, Secretary-Treasurer Warwick, Assistant Treasurer Rittenhouse, Von Schrenk, Vassar, Clemmer, Vice-President Morgan, Cook, Bates, President-elect Delbridge, Richart, and Gonnerman. Messrs. Reeve, Rogers, and Young are absent.

chromium, 1.01; (B) carbon, 0.08; managanese, 0.43; phosphorus, 0.104; sulfur, 0.022; silicon, 0.162; copper, 1.07; nickel, 0.54.

All steels had well-defined yield points. The properties obtained from the impact tests apparently depend upon the type of specimen used. For repeated load specimens free from abrupt changes in section and tested in air, all four low-alloy high-strength steels had endurance limits at least 67 per cent greater than that of structural carbon steel. However, the low-alloy high-strength steels exhibited a greater fatigue notch-sensitivity and were damaged to a greater extent by corrosion-fatigue than ordinary structural carbon steel.

Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys recommended the adoption of two existing tentative specifications covering corrosion-resisting chromium steels (A 176) and high-strength chromium-nickel steels (A 177) and a revision of the requirements for corrosion-resisting sheet, strip and plate (A 167). It was indicated that very satisfactory progress was being made in the collection of data and information covering chemical, physical, mechanical, and fabricating properties of a large number of alloys in this field.

Since many methods of measuring interlamination resistance are in use and there is demand for a standard method, Committee A-6 on Magnetic Properties reported a tentative method of test for measuring interlamination resistance of steel. This is applicable to electrical sheet or strip steel and indicates the effectiveness of the sheet surface oxides or coatings in reducing intersheet losses.

Peter R. Kosting of Watertown Arsenal pointed out that with large cross-sections on 18 per cent chromium, 8 per cent nickel alloy steel castings, there are apt to be intergranular cracks starting at the surfaces and penetrating up to 3/8 in. Studies, involving macrostructure and microstructure, indicate that fine-grain castings will not be prone to such cracking if cooled either quickly or very slowly, but that they may exhibit such cracks if cooled at an intermediate rate. The benefit of quenching such large castings from high temperatures is limited to a very thin skin which may be easily removed during fabrication. This paper, with discussion is published in this BULLETIN.

At the session devoted to iron, there were reports of Committees A-2 on Wrought Iron, and A-3 on Cast Iron, and papers dealing with "The Properties and Uses of Chilled Iron," "Hardness Measurements of Very Hard Steels and White Cast Irons," and "Effect of Size and Type of Specimen on the Torsional Properties of Cast Iron." S. C. Massari, Association of Manufacturers of Chilled Car Wheels, in outlining the basic metallurgy of chilled iron, its production and metallographic nature, pointed out that this material consists in reality of not one, but three kinds of metal: chill proper with most carbon in the combined state; the mottled iron immediately under the chill with some free carbon; and the interior of gray iron. While few data are available on tensile properties because of the extreme hardness of chilled iron, he pointed out that the only marked difference in tensile properties between white and gray portions of the same casting was a definitely higher modulus of elasticity in the chill, about 20,000,000 lb. per sq. in. for the white, as compared with about 15,000,000 lb. per sq. in. for the gray. He outlined recent developments in heat treatment and the effect of some of the generally used alloys.

As a result of a large number of hardness tests including Brinell, scleroscope, Rockwell and Vickers made on very hard steels and white cast irons, Messrs. Vanick and Eash of the Development and Research Division, International Nickel Co., Inc., indicated that the discord in relationships emphasizes the importance of specifying a type of test which possesses a narrower dispersion from the average in individual tests, such as the Brinell, or specifying a sufficient number of individual tests with other methods, with a tolerance on either side of the average sufficient to encompass the expected spread in values.

Tests made on 48 machined specimens from two grades of cast iron were reported in the paper by Messrs. Draffin and Collins of the University of Illinois, dealing with the effect of size and type of specimen on the torsional properties of cast iron. This study supplemented the authors' work of last year on the tensile strength of cast iron.

For solid specimens in torsion the modulus of rupture, modulus of elasticity and maximum tensile unit strain were practically the same for diameters of 1 in. and 3/4 in. For hollow specimens in torsion, with walls of 1/8 in. thick, or a $\frac{t}{r}$ of 0.243, the modulus of rupture decreased from about 39,000 lb. per sq. in. for the solid specimens to about 27,000 lb. per sq. in., the latter of which is the strength of the cast iron in direct tension.

EFFECT OF TEMPERATURE, FATIGUE OF METALS

That there has been no diminution in the interest and work being done in the field of effect of temperature on metals, was evident at the meeting. The Joint Research Committee on Effect of Temperature presented a rather voluminous report outlining results of numerous investigations it is carrying on. One of the projects which should be of much value to all those concerned with the effect of temperature on metals at high temperatures is the volume on "Creep Data" which is soon to be published. This gives extensive information and data developed by the committee covering a wide range of carbon and alloy steels, irons and some non-ferrous metals.

Work on creep test of tubular members subjected to internal pressure indicated that under certain conditions a pressure vessel may decrease in length during service and under other conditions may increase in length substantially at the same rate as the diameter increases. However, the committee in charge drew no definite conclusions, needing certain other data which were not yet available.

A final report on long-time creep tests of a 0.35 per cent carbon steel involving a test duration of 22,438 hr. indicated that the extrapolation from the 2000-hr. period was conservative as compared with actual deformation over 20,000 hr. Other reports covered investigations to ascertain whether an agreement in creep results could be obtained by different laboratories using the A.S.T.M. tentative methods for long-time tension tests and report on the acceptability tests for high temperature characteristics. A report on the effects of manufacturing variables on creep resistance indicated a decided superiority of creep resistance at 750, 850, and 950 F. for coarse-grained plain carbon steel over fine-grained plain carbon steel.

(Continued on page 36)

Forty-Year Members Honored

Thirteen Individuals and Companies Members Since 1898

ONE of the very interesting occasions at the 1938 Annual Meeting was the recognition of a number of individual and corporation members who have been affiliated with the Society continuously since 1898, when the American Section of the International Association for Testing Materials, the forerunner of the Society, was formed. As indicated in the list appearing below, several of the individual members as well as representatives of a number of the corporations and other type memberships were present at the First Session of the annual meeting when the ceremony took place. In introducing the members President White outlined some interesting facts in connection with the organization of the Society.

"Our Society had its beginning when about twenty American members of the International Association for Testing Materials met in the Engineers' Club, Philadelphia, on June 16, 1898, in response to a call issued by Mr. G. C. Henning, who was the American member of the Council of the International Association. At that meeting it was resolved to form an American Section of the I.A.T.M.; Prof. Mansfield Merriman was chosen chairman, with Richard L. Humphrey as secretary. An Executive Committee was formed which held meetings on June 25 and July 30 of that year and at the latter meeting plans were laid for the first annual meeting of the American Section on August 27, 1898.

"This meeting was held as planned at the Engineers' Club, Philadelphia. By-laws were adopted. The meeting considered problems that committees of the I.A.T.M. should study. A resolution was offered by Dr. Richard Moldenke requesting the International Association to appoint a committee to investigate methods of testing cast iron. Prof. William K. Hatt inquired as to the status of impact tests and the discussion that followed led to the appointment of a committee consisting of Professor Hatt and Prof. Edgar Marburg to determine 'the present state of knowledge of impact tests.' The preliminary report of that committee made at the second annual meeting in 1899 is the first technical report presented to and published by the American Section, comprising Bulletin No. 5, dated October, 1899. At this meeting, 40 years later, we are still discussing impact testing.

"Professor Hatt happily is with us today and later on in this session we shall have the pleasure of conferring a special honor upon him for his attainments in this, our chosen field. Professor Marburg, as we all know, was for many years Secretary of the Society; his name is honored and revered in our Society and commemorated through the Edgar Marburg Lecture.

"It is interesting to observe that two other subjects were discussed quite vigorously at this first annual meeting. They are, 'The Relation of the International Association to Producers and Consumers' and 'In What Manner will the Adoption of Standard Specifications Improve Industrial Methods and Processes.' It is a matter of history that the ideas and opinions that developed on these two subjects in the three years following that first meeting led to the decision that a separate American Society for Testing Materials should be organized as was done in 1902.

"It is good for both individuals and organizations at times to look back, not merely to reminisce, but to mark progress that has been made and experience that has been gained, so that we may better chart the course for the future. In looking back over these years, we have been interested to see that of the 70 members of the American Section in 1898 there are 13 who are still members and have been members continuously throughout these 40 years."

At this point Doctor White recognized the forty-year members, asking those who were present to rise, and at the conclusion he announced that the Executive Committee of the Society felt it fitting that each member or company representative should receive an engrossed certificate commemorating their forty-year membership.

List of Forty-Year Members

Individuals

Barbour, Frank A., Consulting Hydraulic and Sanitary Engineer, Boston, Mass. Member Executive Committee 1933—1935.

*Dow, Allan W., Vice-President and Chief Engineer, Colprovia Roads, Inc., New York City.

*Hatt, William K., Research Professor, Purdue University, Lafayette, Ind. Member Executive Committee 1915-17, 1922-24; Honorary Member, 1938.

**Jarecki, Alexander, President, Jarecki Manufacturing Co., Ltd., Erie, Pa.

Lundteigen, Andrew, Vice-President, Ash Grove Lime and Portland Cement Co., Kansas City, Mo.

Sabin, Alvah Horton, Chemist, Flushing, New York.

* **Sauveur, Albert, Metallurgical Engineer, Professor of Metallurgy, Harvard University, Cambridge, Mass. Member Executive Committee, 1913-15; Marburg Lecturer, 1938.

Talbot, Arthur N., Professor Emeritus, University of Illinois, Urbana, Ill. President, 1913-14; Honorary Member, 1923; first Edgar Marburg Lecturer, 1926.

Firms and Corporations

*American Foundrymen's Assn.—Representative in 1898, Dr. Richard Moldenke, Secretary. Present representative, Robert E. Kennedy, Technical Secretary, Chicago, Ill.

*Bethlehem Steel Co.—Representative in 1898, Albert Ladd Colby, Metallurgical Engineer. Present representative, E. F. Kenney, Metallurgical Engineer, Bethlehem, Pa.

**Booth, Garrett & Blair—Present representative, Frederick Wynkoop, Philadelphia, Pa.

*Carnegie steel Co.—Representative in 1898, John McLeod, Assistant to President. Now the Carnegie-Illinois Steel Corp. Present representative, C. F. W. Rys, Chief Metallurgical Engineer, Pittsburgh, Pa. J. O. Leech, Assistant Manager, Metallurgical Dept., represented Mr. Rys, who was unable to be present because of illness.

Franklin Institute—Representative in 1898, Dr. Wm. H. Wahl, Secretary. Present representative, Alfred Rigling, Librarian, Philadelphia, Pa.

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*Present at the meeting.

**Membership in I.A.T.M. dates from 1896, two years before the American Section was formed.

March 1937 Bulletins Requested

THE stock of copies of the March, 1937, ASTM BULLETIN has been exhausted and since there is a continuing demand for this issue, it will be appreciated if members who can do so conveniently would send their copies to A.S.T.M. Headquarters.

Three Honorary Memberships Awarded

Messrs. Clements, Hatt and Moore Are Recipients

THREE long-time members of the Society, each an eminent authority in the field of engineering materials and each having contributed in many important ways to the advancement of the Society's work and its welfare, were awarded Honorary Memberships at the Forty-first Annual Meeting, by unanimous election of the Executive Committee. The awards were made to the three men—F. O. Clements, W. K. Hatt, and H. F. Moore by President White, after the citations were reported as indicated below.

FRANK ORVILLE CLEMENTS

Doctor Clements was conducted to the president by Dr. G. H. Clamer, who outlining Doctor Clements' various activities mentioned his old friendship with Doctor Clements and that they had met first in the office of Charles B. Dudley first president of the Society, who was chief chemist of the Pennsylvania Railroad Co. at Altoona. Here was one of Doctor Dudley's assistants of 40 years ago being presented by one who had been awarded honorary membership the year previous, both men being still active in numerous phases of A.S.T.M. work. Doctor Clements, in responding, referred to his early work with Doctor Dudley. In expressing his appreciation of the honor conferred, he mentioned two projects which are very close to him, namely, the development of student membership so that the younger engineers and scientists can learn about the Society, and also the continuing development of the research fund, a special endowment committee on this project being headed by Doctor Clements.

Biographical Sketch

Doctor Clements is a graduate of Otterbein College, Ohio, with the degrees of A.B. in 1896 and M.A. in 1898. He also received the degree of M.Sc. from Ohio State University in 1899, and was awarded the honorary degree of Doctor of Science by Otterbein College in 1930. He was employed by the Pennsylvania Railroad as Assistant Chemist from 1899 to 1903, and at this time was associated with Dr. Charles B. Dudley, first President of A.S.T.M. (1902 to 1909. From 1903 to 1905, he was Principal Assistant Chemist with the Union Pacific Railroad and from 1905 to 1916, Chief Chemist and Engineer of Tests, National Cash Register Co., Dayton, Ohio. From 1916 to 1920, he served as Director of Research, Dayton Metal Products Co. Since 1920 he has been Technical Director of the Research Laboratories, General Motors Corp.

He is a member of numerous societies, including the American Chemical Society, Electrochemical Society, British Institute of Metals, Society of Automotive Engineers, Detroit Engineering Society, Dayton Engineers Club, A.A.A.S., Michigan Academy of Science and American Society for Metals. He is President of the Board of Trustees of Otterbein College and Director, Detroit Metropolitan Board, Y.M.C.A.

Doctor Clements has been active in various phases of Society work. As chairman of the Detroit District Committee from 1930 to 1936, he contributed notably to increased interest in Society activities in that District, particularly with regard to the first Regional Meeting and the 1935 Annual Meeting, which were held in Detroit.

Doctor Clements was a member of the A.S.T.M. Executive Committee from 1927 to 1929; Vice-President from 1929 to 1931 and President in 1931-32. He gave exceptionally helpful leadership and guidance to the Society especially during a difficult period.

WILLIAM KENDRICK HATT

In introducing Doctor Hatt, Mr. P. H. Bates outlined the extensive and wide range of his activities, commenting on his early work in the Society. Doctor Hatt expressed his deep appreciation of the honor and also tendered Purdue University his thanks for giving him the opportunity for 45 years to do the things he liked to do best, including the development of young men and taking an active part in various organizations with which he has been affiliated. He mentioned that during his life he seemed to be going from one thing to another and building up, and that now he was creating an organization to carry out considerable investigative work in connection with the highways in the state of Indiana.

Biographical Sketch

Professor Hatt was educated at the University of New Brunswick, receiving the degrees of A.B., 1887, A.M., 1898, and Ph.D., 1901. He also received the degree of C.E. from Cornell Univrsity, 1891. He began his teaching career as Professor of Civil Enginering at the University of New Brunswick in 1891-2, followed by a year at Cornell University, whence he came to Purdue University in 1893. In his forty-five years at Purdue, he has taught applied mechanics and civil engineering, since 1907 as Professor of Civil Engineering and Director of the laboratory for testing materials. He has served on many state and national commissions on work involving conservation, flood prevention, patent suits, highway research, building codes, etc. He was consulting engineer on timber tests, U. S. Forest Service, 1902 to 1908; on a committee on education and special training, War Department, 1918-19; member of Building Code Committee, U. S. Department of Commerce, 1921, chairman, 1928; member of Consulting Board on Materials of Hoover Dam, 1931. An outstanding expert on reinforced concrete and building materials, his services have been in wide demand.

He is the author of "Laboratory Manual for Testing Materials," "Concrete Construction" (Encycl. Americana), co-author of "Concrete Work," and has written many articles on research in materials and construction. He received the Fuertes Gold Medal (Cornell, '03) and the Turner Gold Medal (A.C.I., '29). He is a member of many technical societies including the American Society of Civil Engineers, Indiana Engineering Society, Society for the Promotion of Engineering Education, American Railway Engineering Assn., and the American Concrete Inst. He was president of the A.C.I. in 1917 to 1919 and was made an honorary member of the Institute in 1932.

W. K. Hatt H. F. Moore F. O. Clements

Doctor Hatt has been a member of the Society since 1898. One of his early contributions to the Society literature was a report on impact tests, prepared jointly with Edgar Marburg in 1899. He was a member of Committee D-7 on Timber from its organization in 1904 to 1921 and was its first secretary, serving from 1906 to 1915. He was active, especially in the early years, in the work of a number of committees including the groups on cast iron and brick and served on Committee E-1 on Methods of Testing from its organization in 1904 through 1919. He has served two terms on the Executive Committee of the Society, 1915 to 1917 and 1922 to 1924.

HERBERT FISHER MOORE

Professor Moore was presented by one of his old-time friends and colleagues, Prof. F. E. Richart, who outlined some of his versatility in fields other than technical ones, including music, choral work, amateur theatricals and others. Professor Moore in responding mentioned that Rudyard Kipling in one of his stories made the statement that the expressed appreciation of a man's professional associates is the most delightful; and, at the same time, may be the most dangerous intoxicant which he can have, and that to him the expressed appreciation of the members of the Society with whom he had worked for so many years was very sweet. He said that while he did not know what words were written on the certificate, he would always see written there a great man's words, words of warning, words of appreciation and words of criticism and that he hoped that these would keep him from the more evil effects of the intoxication which he now faced.

Biographical Sketch

Professor Moore is a graduate of the University of New Hampshire, B.S., 1898 and of Cornell University, M.E., 1899 and M.M.E., 1903. After serving as instructor at Colby Academy, N. H., and at Cornell University, and as mechanical engineer for Riehle Bros. Testing Machine Co., he went to the University of Wisconsin as Instructor and Assistant Professor of Mechanics for the period from 1904 to 1907. He joined the staff of the Department of Theoretical and Applied Mechanics at the University of Illinois in 1907 and since 1922 has been Research Professor of Engineering Materials. Most of his time at Illinois has been devoted to research in the properties of materials and in methods of testing. He is known internationally for his extensive work on fatigue of metals and in recent years, he has conducted an elaborate investigation of failures of railroad rails. He has designed various testing machines and apparatus for measuring strains. His tests have covered a wide range of materials as well as structural and machine parts.

He is the author of several books, including "Textbook on Materials of Engineering," "Endurance of Metals Under Repeated Stress," "Fatigue of Metals" (co-author), and "Materials" (Section of Merriman's Handbook); also of about thirty Bulletins of Illinois Engineering Experiment Station and of numerous articles in the technical press. He is a member of the American Society of Mechanical Engineers, Society for the Promotion of Engineering Education, American Association for the Advancement of Science (past v.p.), and British Institute of Metals. In 1930 he was Medallist of the Iron and Steel Institute. He was awarded the honorary degree of Doctor of Science by the University of New Hampshire in 1922.

A member of the Society since 1903, Professor Moore served on the A.S.T.M. Executive Committee from 1919 to 1921, was Vice-President, 1925 to 27, and President in 1927 to 28. One phase of his valuable work for the Society has been in connection with the activities of Committee E-1 on Methods of Testing, of which he has been a member for over 20 years. He is the present chairman of the subcommittee on mechanical testing and the section on calibration of testing machines and apparatus. He has served as chairman of the Research Committee on Fatigue of Metals since its organization in 1928 and was the first chairman of the Society's Committee E-9 on Research, serving for ten years until 1934.

1939 Regional Meeting in Columbus; Annual Meeting and Exhibit at Atlantic City

For some time past the Executive Committee of the Society has been giving consideration to the various problems involved in the selection of places for the 1939 Regional Meeting and the next Annual Meeting of the Society. It has been decided to hold the Regional Meeting and Spring Group Meetings of Committees in Columbus, Ohio, during the week beginning March 6. There has been an earnest desire on the part of a number of active members in the Columbus area to have a meeting there and a committee to handle local arrangements for the meeting has been organized under the chairmanship of C. E. MacQuigg, Dean, College of Engineering, Ohio State University.

Discussion of topics which might be featured in technical sessions of the Regional Meeting resulted in the selection of a symposium on lime and a symposium on heat insulation. Committee C-7 on Lime will cooperate in sponsoring the former, and Committees C-8 on Refractories and C-16 on Thermal Insulating Materials will develop the latter. The American Society for Heating and Ventilating Engineers has been invited to cooperate in developing features for the symposium on heat insulation.

In connection with the Forty-second Annual Meeting of the Society which is to be held in Chalfonte-Haddon Hall in Atlantic City from June 26 to June 30, although there were a number of viewpoints considered, it was the general consensus of the officers, and other members of the Society who were consulted, to go back to Atlantic City next year. One of the factors which weighed heavily in the selection was the proximity of Atlantic City to the 1939 World's Fair in New York. While there has not been stated definitely a formal policy of meetings, it has been the general practice that at least one out of three meetings be held in the Middle West and it is expected that the following annual meeting will be held in some inland industrial center.

In line with the policy of sponsoring exhibits of testing apparatus and related equipment every two years, the fifth exhibit will be held in conjunction with the 1939 meeting. In the opinion of many members, the fourth exhibit held in New York City was one of the finest technical exhibits they had witnessed, due largely to the close interest and cooperation of the companies in the industry and also numerous displays sponsored by Society committees. Satisfactory facilities for the exhibit are available in Chalfonte-Haddon Hall and it is expected that the 1939 exhibit will stress many important new developments.

Bibliography of Textile Test Methods

The Bibliography of Textile Test Methods which appeared serially in the May and June issues of *Rayon Textile Monthly* has been reprinted in separate pamphlet form and those interested can obtain copies at 25 cents each by writing this textile journal, 303 Fifth Ave., New York City. This bibliography was prepared by H. A. Mereness of the National Federation of Textiles, Inc., and is divided into official, and semi-official methods and unofficial test methods, some 40 divisions being incorporated covering methods and tolerances, fiber identification and quantitative analysis, shrinkage, crease resistance, color fastness to numerous materials, etc.

Progress in Wool Standardization[a]

By G. E. Hopkins[1]

SYNOPSIS

Standards are primarily concerned with defining the material involved and setting up uniform procedures to measure its quantity and its quality. Wool, a natural product, shows wide variations in important characteristics and being closely associated with traditional and artistic uses, it is difficult to adapt scientific criteria to the established customs of describing quality, or even to its definition. Evaluation of wool products is considerably simpler than evaluation of wool fiber because more definite utility criteria have been acknowledged. Fairly complete standards are already set up on finished products and to some extent on yarns. Work on wool fiber shows promise. The determination of shrink has been clarified but is not yet standardized. Progress has been made on the classification of fine wools by actual measurement of fiber diameter and tests to show chemical deterioration of wool have been developed.

THE following discussion outlines the progress in the standardization of methods of evaluating wool, including wool in its raw form and in its various manufactured products. Brief consideration is given to the problems involved, the progress which has been made thus far, and the immediate requirements in further standardization.

In discussing the progress which has been made, the paper is not confined to the work within the American Society for Testing Materials. To do so would not only unnecessarily restrict our field, but the placing of such boundaries is practically an impossibility. The advance made under the auspices of all the groups working on wool standardization, wool test methods, wool research, and on the development of wool manufacturing processes is tremendously interrelated. Each step forward in any one of these lines of activity is reflected by advances in the others.

DEFINITION—QUANTITY AND QUALITY

There are three fundamental points to be covered in the development of standards and test methods.

First, the material must be defined; that is, limitations must be set up within which should fall all of the variations allowable without going beyond the class or type of material being standardized.

Second, means must be provided for determining the quantity or how much of the material is present in a given lot. Very few commercial materials are consistently handled in a pure state. They are commonly handled, bought, sold, and processed, intimately associated in physical and in chemical combination with a variety of foreign materials. Hydroscopic materials contain moisture. Textile materials usually contain various types of oils. Manufactured textiles may contain combinations of fibers. Raw materials in the textile trade contain dust and other impurities associated with their natural occurrence.

These closely allied impurities or supplementary substances are present in varying amounts. Some of them are harmful and interfere with the desired characteristics of the principal material, either by dilution or actual change in properties. Some of these substances are necessary to the maintenance of the best quality characteristics, and usually in such cases the optimum values are obtained when the supplementary materials are present in certain specified amounts. Because of the influence of these supplementary substances on weight, volume, and physical and chemical characteristics, it is practically a necessity that standard test methods be set up in such a way that the actual quantity of the principal substance can be determined, or as an alternative, so that the total quantity of primary material and ideal percentages of secondary substances may be determined.

The third point to be covered is the determination of the quality of the material, or, "how good is the material." We must establish how closely a given lot of the material compares with the average for the material, the best possible quality, or other points of reference.

PECULIAR PROBLEMS OF WOOL STANDARDIZATION

Superficially, these points may appear to be obvious. Inspected objectively without reference to any of our common textile materials, it would appear that it should be easy to fulfill these fundamental steps in developing test methods. With textile materials, however, and particularly with wool, very real problems have been presented.

First of all, wool is not only a natural product, but many types of wool are produced under the most primitive circumstances and hence do not enjoy even those regularizing influences of cultivation and breeding. Wool comes to us with a tremendous range of uncontrolled variations. Moreover, these variations are such that in their extremes they overlap and blend with those of totally different materials. For example, the physical characteristics of some of the softer, finer, most lustrous wools approach some of the physical characteristics of silk; while the characteristics of some of the coarser, longer wools approach the characteristics of horse hair. The serrations on the wool fiber may be so numerous and prominent as to resemble those on rabbit fur or, on some wool fibers, may be as scarce as on human hair.

In addition to the fact that wool is a natural product with wide variations, it is also an historic material. It has been in common use so long that strong traditions have been built up around it. These traditions have to do with its classification. They tend to limit the methods of processing it, and they have strong influence on the methods of measuring and determining its quality. Furthermore, its use and to a large extent its processing, has been very closely associated with the arts.

As a result of these two points, many standards and many methods of evaluating the utility or even the quality have been developed almost totally without benefit of the scientific method of attack. Like other materials in the hands of artisans and craftsmen it is judged, even down to the present time, almost completely by organoleptic means.

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[a] Presented at the Forty-first Annual Meeting, Am. Soc. Testing Mats., Atlantic City, N. J., June 27-July 1, 1938.

[1] Technical Director, Bigelow-Sanford Carpet Co., Inc., Thompsonville, Conn.

As with any subject of traditional thinking, ideas pertaining to wool and these inherited ideas of wool standards have become firmly set in their historic grooves. Because the different parts of the wool industry have, through the ages, and more particularly through the last century, been divided into relatively unrelated interests, we frequently find very definite and long-established ideas at considerable variance with one another. For example, the ideas which will be found in the rug industry pertaining to the scope of the fibers which may be classed together as wool are quite different from those which are found in the clothing industry. Similarly, the ideas of criteria to determine value of, or to be used in classifying, wools are quite different in the rug industry than in the clothing industry. In the rug industry, wools have always been classified according to their source, principally because their source gave a moderately close indication of the physical characteristics, such as crimp, length of fiber, luster, softness, etc. In the clothing industry, the standards have been based almost entirely on fiber diameter as expressed by the term "fineness." The knowledge of most sources of carpet wool, however, give little indication regarding the fiber diameter or fineness. Within each fleece of the primitive wools, tremendously wide variations in the diameter will be noted. However, fiber diameter is a relatively unimportant characteristic in judging the utility of a wool for the purpose of making rugs or carpets.

The term "fineness" you will note is more closely associated with the senses than "fiber diameter" which is more closely associated with mechanical and instrumental measurement. Within the groups of fibers used in the clothing industry, the fineness classification has given results sufficiently satisfactory for practical manufacture. The variations in the crimp, luster, curl, and length of fiber are of secondary importance.

All of this background regarding wool has had a tremendous bearing on the difficulty of setting up scientific, reproducible standards for the industry, of establishing definitions, of establishing measures of quantity, and in establishing measures of quality.

WHAT HAS BEEN ACCOMPLISHED

The Wool Subcommittee of A.S.T.M. Committee D-13 on Textile Materials has not succeeded in establishing a definition for "wool." On the face of it, this may seem absurd but there are two points to be brought out in this connection. First of all, a strict indication of the definition of wool is not necessary to establish the validity of the test methods. Nearly all of the controversy regarding the limitations of a definition for wool has to do with whether or not similar fibers and fibers from the covering of animals similar to sheep should be included. This same similarity of fibers which causes this confusion in the wool definition also makes the test methods and standards which are developed for wool, applicable almost directly to the other fibers involved.

Before being too critical of our failure to obtain a definition, may we point out that we have considerable precedent in other industries, at least one of which is a relatively new industry and an industry strongly fortified with engineering and technical assistance almost from its beginning? For example, I understand that the books of the Society do not yet include a satisfactory definition for "steel." The ceramic industry has had similar troubles in determining a definition for "brick." The combustion field has had its troubles in establishing a definition for "coke."

The activities toward the development of a definition for "wool" have not been confined to those within the Society. Nor have other groups or other activities supplied us with very definite precedent upon which to rely. The Treasury Department has grouped the hair and the fur of the sheep, angora goat, alpaca, and vicuna and other similar fibers in one large class to which the limitations and rulings set up for wool apply.

Similarly, the Department of Agriculture and the various associations of manufacturers have indicated the inclusion of the coats from a variety of animals under the term "wool" without definitely setting up a complete list of the animals to be included, or criteria by which the inclusion or exclusion of a fiber may be determined.

Turning to the second division of work on test methods, we have the problems which have to do with the determination of the amount or quantity of wool. Here again the problem of definition comes up although in a new form unrelated to the source of the fiber. I have mentioned the variety of substances which may be found closely associated with the textile fiber at nearly all points of its production, processing, and use. We have moisture present in various quantities depending upon the history and the atmosphere with which the fiber is in contact. We have oil present in various quantities. If all moisture and all oil is removed from the fiber, the characteristics of the fiber are considerably different than those which we usually associate with the characteristics of wool and within our present conceptions the fiber is inferior. If, therefore, moderate amounts of oil and moisture must be present to enable the wool to behave as we would expect wool to behave, it is difficult, particularly in a traditional industry, to set up test methods, to determine the amount of wool present, which depend on the complete elimination of both moisture and oil. On the other hand, if these materials are not completely eliminated we are faced with the highly controversial problem of determining and establishing exactly how much moisture, and how much and what type of oil should be associated with a fiber we will consider as wool for the purpose of quantity measurements.

In this connection, we are also faced with the problem of defining commercially clean wool. As used it refers to wool not only containing ideal ranges of oil and moisture, but also burrs, dust, suint, and other impurities present to a degree less than that which would interfere with normal commercial operations. As normal commercial processes differ widely, the allowable proportion of impurities is a considerably varying quantity. At the time of the organization of the Wool Subcommittee there were available no criteria for establishing the exact characteristics of a commercially clean or a commercially scoured wool, in spite of the fact that millions of pounds are being bought and sold each month on a weight basis, and the utility of the material is definitely based on the actual wool content.

The Wool Subcommittee has worked out a partial clarification of this picture. We have not yet been able to develop a sampling system which would assure equitable sampling procedures to be applied to large purchases so that a precise laboratory test can be performed similar to the procedures used in determining the B.t.u. value of a shipment of coal. The first work of the Wool Subcommittee was directed to

a compromise between the common commercial scouring procedures and a laboratory technique. The test method provided for careful sampling procedures for the selection of a large sample appropriate for commercial scouring equipment operated under laboratory control. The thoroughness of the scour was controlled through laboratory check tests on the cleanness of the resulting sample rather than on precise control of the scouring itself. This in effect was dependent on the acceptance of a material called "hard scoured wool," applied to wool containing known and standard percentages of moisture, oil, and other impurities.

The committee then continued work toward solutions of those problems which had thus far interfered with the setting up of a complete and independent laboratory determination. At the present time the Department of Agriculture and the Appraiser Stores are also actively engaged in improving laboratory methods of determining the actual amount of real wool present in a commercial lot.

So much for the definition of wool and the determination of amount. We now come to the third or last class of tests, the determination of the quality of a lot of wool. Quality determinations of wool products have in general proceeded more rapidly than the quality determinations on the wool fiber itself. This is due to the fact that in the case of wool products we can with fairness limit the number of characteristics which are to be measured. Moreover, the influence of these characteristics on the utility can, in the case of manufactured products, be comparatively easily determined. A blanket, for example, is valued first for warmth, second for eye appeal. Lightness is also an important factor. It is a comparatively easy matter to determine the heat transmission per unit area, the weight per unit area, while the eye appeal is a matter of styling and construction. One can also determine the modifications in heat transmission and weight per unit area as the blanket is subjected to its normal service and laundering.

Similarly, clothing can be tested for its warmth, indications of its durability may be obtained, its color fastness evaluated with a moderate degree of accuracy, as well as the behavior of the fabric toward common cleaning methods and other exposures incident to normal service. Test methods applicable to these points were available to the industry at the time the Wool Subcommittee was organized. Since its organization, however, test methods used in individual laboratories have been brought into better agreement and standards set up entitled Tentative Methods of Testing and Tolerances for Certain Wool and Part Wool Fabrics (D 462 – 37 T). A series of test methods for wool felt (D 461) have been set up. Work of the American Association of Textile Chemists and Colorists, the National Bureau of Standards, and the Division of Trade Standards on these fabrics is well known.

All in all, the tests on wool products have been and are being very thoroughly studied with every promise of the successful evaluation of each characteristic as requirements for knowledge of these characteristics are proved necessary. Perhaps the most difficult point now under study is the resistance to abrasion, where the correlation between standard abrasion methods and various types of service, in many fabrics, deserves additional attention.

Test methods on wool materials in the process of manufacture, as for example, in woolen yarn and woolen top, have also proceeded rapidly and we have our Standard Methods of Testing and Tolerances for Woolen Yarns (D 403 – 36), and Standard Methods of Testing and Tolerances for Worsted Yarns (D 404 – 36), on woolen and worsted yarns which have been developed by the Wool Subcommittee in addition to the various physical and chemical tests produced by the American Association of Textile Chemists and Colorists, the National Bureau of Standards, and independent work in many industrial textile laboratories. Determination of strength, elongation, and elasticity are common routine determinations.

The Wool Subcommittee of Committee D-13 has successfully hurdled the barriers having to do with "yarn number" by approving the Typp System to replace a whole series of numbering systems commonly used in the trade. They have succeeded in defining "direction of twist," "standard atmospheric conditions," "combing yarn," "worsted yarn," and "woolen yarn."

When we come to the raw wool, that is the bulk fiber as purchased by the top maker and the manufacturers of woolen yarn, evaluation of quality is more difficult. First of all, the relationships between the physical and chemical characteristics of the wool fiber itself, and the degree to which they influence the desired characteristics in the various wool products is not definitely established. The average mill is not in a position to state definitely what measurable characteristics of the fiber give the best characteristics of warmth, resilience, or abrasion resistance in the finished product. Of course, there are exceptions and a craftmanship has developed whereby with organoleptic inspections wool blends are selected to produce given characteristics in a desired product. In this method of selection, however, personal influences are extremely prominent. The ideal is approached with varying degrees of success. As closer control is provided for the manufacturing processes, as the specifications of the final product are being more and more carefully defined, and as the competitive situation in the industry becomes keener, the necessity of close correlation between the raw fiber characteristics and the effectiveness of the fiber in the manufacturing processes and in the finished product becomes imperative. Personal opinion is looked on with suspicion. The tolerance within which organoleptic inspection operates and which was formerly considered quite reasonable, is now being considered wasteful and an active demand is set up for scientific evaluation.

Fifteen years ago the first move was made toward establishing uniform standards for the classification of wool and wool top. A representative committee from the United States met with representatives of the woolen industry of England and established the standards for classification of wool and wool top as to fineness, which have, since that time, been sent out in the Government wool sample boxes. These standards are now supplemented by numerical evaluation of fiber diameter as outlined in Standard Methods of Test for Fineness of Wool (D 419 – 37), and actual tentative standards have been set up for the classification of the finer wools according to the result of fiber diameter determinations. There is much at the present time being done in the technical analysis of the other characteristics of the raw wool, such as staple length, curl, crimp, resilience, abrasion resistance, etc.

We are just beginning to make headway in the evaluation

of the chemical characteristics of the wool fiber and the study of the effects or variations in the chemical condition on the utility of the final product and in the efficiency with which the fiber is handled in manufacturing.

Wool is generally considered to be a moderately inert material. This conception is somewhat misleading in the light of our recent knowledge on the subject. The Committee on Chemistry of Wool, operating under the chairmanship of Mr. Eavenson, sponsored by the American Association of Textile Chemists and Colorists and carried on under the direct supervision of Dr. Milton Harris of the National Bureau of Standards, indicates that wool is in reality very active chemically. Doctor Harris' work and Dr. Werner von Bergen's work have shown that wool is susceptible to deterioration on direct exposure to sunlight and to the elements. This deterioration affects the shade taken from a given dye solution, its susceptibility to damage from alkaline baths, and its resistance to abrasion. Doctor Von Bergen has developed methods of determining previous chemical damage to wool fiber by studying under the microscope the swelling of the fiber when brought into contact with dilute caustic soda solution. Doctor Harris has developed a criterion for the chemical damage of wool fiber in which the solubility of the fiber in a standard solution of caustic soda is determined. Both methods of test are directly applicable in studying damage to wool fiber by weathering, by bleaching, by prolonged exposure in the dye bath, and, under some conditions, by the exposure to high temperatures in drying. A correlation between this type of chemical test and the resistance to abrasion of the same fibres when exposed to certain of our abrasion tests has been established. To perform this abrasion test on fabrics requires that the fiber must be made into yarn and woven. In these processes, additional damage may be encountered and the effect of variations in spinning and weaving will be superimposed on the effect of variations of the fiber itself. The direct application of the chemical test to the fiber allows the use of a small sample consisting of a few fibers without subsequent processing, thus making possible a determination of quality in cases where previously no tests were available. No doubt some form of this test method will eventually be adopted by the Wool Subcommittee.

REQUIRED WORK

I have attempted to outline something of what has been accomplished to date in the various fields of effort. There is of course much which remains to challenge our interest and our ingenuity. We need to establish a scientific conception of what is meant by clean wool and we must set up a scientific laboratory method of determining the amount of clean, impurity-free wool in any given lot. This test, commonly referred to as shrink test, must include a sampling procedure which will enable us to sample domestic and foreign wools so as to assure adequate representation of the entire lot. The yield of clean wool reported in the results must indicate the actual content of valuable fiber present and we must be able to check results performed on the same shipment in different laboratories or at different times.

We must have a method of evaluating the physical characteristics of wool fiber. We are particularly interested in the evaluation of the effect of the physical characteristics of these fibers on the quality and durability factors of the manufactured products. The tests must measure these characteristics independently from the manufacturing variations, which creep into any test where the wool sample is studied through processing a small lot by what is hoped to be standard manufacturing procedures, as in such tests confusing influences between the characteristics of the wool to be tested and the uncontrollable variations in the complicated processing operations necessarily precludes a scientific evaluation of the quality of the fiber itself.

We must have utility tests for the durability of wool products. Laboratory equipment is required for accelerated indications of how wool products will stand up under the conditions of the normal service which each product is expected to encounter. Such a test should not be confined to abrasion, but all features which affect the physical deterioration of the product must be included, and in their proper proportions. The test should be uniformly applicable to all types of fabrics which may be conceivably placed in service for a given purpose.

It would seem that these demands are a sufficient challenge to Committee D-13 and to the other worthy groups interested in the development of scientific tests for the textile industry. I know that this challenge will be enthusiastically answered.

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A Level-Bubble Strain Gage[a]

By Rex L. Brown[1]

SYNOPSIS

The paper describes a strain gage which has a sensitivity to seven millionths of an inch. A 5-sec. level bubble is used as a measuring device. It is fastened to the moving leg of the instrument, and its level changes with strain along its gage length. The instrument is adapted for use along horizontal gage lines, and has been used to measure very small strains in the concrete of reinforced-concrete slabs.

THE sensitivity, range, and accuracy required in any strain gage depend upon the type of service for which it is to be used. When a strain gage is to be used to measure strains in metals within the elastic range there is required a high degree of sensitivity and, if strains are to be translated into stresses, a high degree of accuracy. In this case, however, the total range of motion can be small.

If the strain gage or extensometer is to be used to measure *variation* of strain and stress, a short gage length is highly important. A strain gage measures the average strain over its gage length. The shorter the gage length the more nearly is it possible to get useful measurements of variation of strain for different parts of a member. For measuring elastic strain the necessary sensitivity may be obtained by some form of amplification of the reading. Any mechanical amplification means that a smaller force is available to operate the indicating device of the strain gage. When extreme magnifications are used even the variations in the minute forces required to operate the indicating devices may be a source of appreciable error in the strainometer. This is especially true if it is attempted to read strains varying from zero to a maximum. The friction of rest of indicating parts is greater than that of motion and there is usually a lag before an extensometer indicating device begins to move. Various types of amplifying devices have been used. Among them may be mentioned a compound lever system (Huggenberger), the simple lever with a witness mark viewed through a microscope (Ewing), the low-magnification lever using an interferometer to indicate motion (Vose), and the use of various types of electrical and photoelectric amplification apparatus, and the optical lever (Martens). In connection with an investigation of flat slabs carried on by F. E. Richart, V. P. Jensen and N. M. Newmark in the Arthur Newell Talbot Laboratory of Materials Testing, University of Illinois, it was found desirable to measure small strains in the concrete—strains produced by light loads; and to measure these strains over a relatively short gage length. The level-bubble is one of our oldest precision instruments. The use of the level-bubble in instruments for comparing standards of length[2] is not new but its application to an extensometer for measuring strains involves features that may be of interest. This paper describes a level-bubble extensometer developed by the author for this purpose.

The principle of this instrument is the use of very sensitive level bubbles to indicate small angles of motion. Figure 1 shows the instrument used. Its gage length $a\,b$ is 4 in. All of the gage lines are in a horizontal plane. The multiplication of strain is 3300 times. The movable leg, $b\,c$, of the instrument serves as a lever which is attached to the frame $d\,e$ by a plate fulcrum f. The rotation is measured by the motion of the bubble in a sensitive level bubble $g\,h$ attached to this movable leg. The motion of this bubble indicates the change in angle with respect to the earth. The change with respect to the frame of the instrument, which measures the change due to the strain, is measured by the use of an auxiliary level bubble $j\,k$, which is attached to the frame of the instrument. This auxiliary bub-

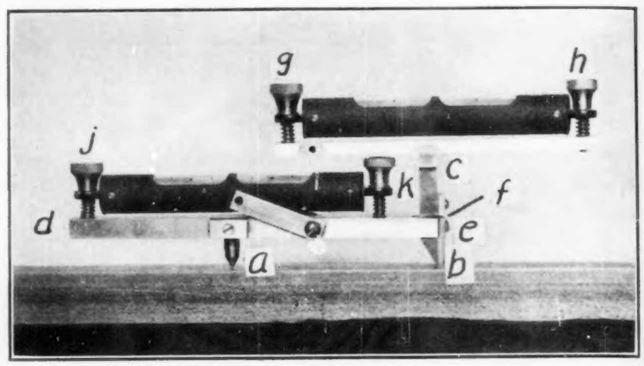

Fig. 1.—Level-Bubble Strain Gage.

The instrument is shown equipped with two bubbles and mounted on the upper surface of a test slab of reinforced concrete.

ble measures any change of the angle which the gage line makes with the earth. The difference of the changes of reading of the two bubbles is a measure of the strain.

The contact edge b of the movable leg is a knife edge $\frac{3}{4}$ in. wide, relieved in the middle portion. The fixed leg a terminates in a sharp conical point. The instrument thus stands on three supports, and when used on the top side of the slab stands up without additional support. When used on the under side of the slab the instrument is held against the lower surface by means of a spring. The bubbles were turned over to put their curvatures in the proper position.

The design of this instrument obviously requires that it be used as an attached extensometer. That means that the instruments available were attached at definite locations and the strains under a definite load on the slab were measured. In practice the instruments were then reversed end for end and the loading repeated. This procedure did away with the necessity of using an auxiliary bubble on the frame of the instrument.

The bubble used has nominally a movement of one division on its scale for an angle change of 6 sec. of arc. For the particular instrument used, the values of the total strain of one division motion of the bubble was approximately 0.000007 in. The bubble is read at both ends and the angular motion estimated to one-tenth of a division on the scale of the glass tube, the average of four readings (two with the instrument one way, two in the reversed direction) was used to obtain values of strain. Probably the smallest motion

[a] Presented at the Forty-first Annual Meeting, Am. Soc. Testing Mats., Atlantic City, N. J., June 27-July 1, 1938.

[1] Associate in Theoretical and Applied Mechanics, University of Illinois, Urbana, Ill.

[2] *Professional Paper No. 24*, Corps of Engineers, U. S. Army, p. 56 (1882).

which can be read accurately is one-fifth of a division.

Due to manufacturing processes level bubbles of this sensitivity do not have the uniformity of scale which dial gages have. Each bubble motion is, then, calibrated to obtain the value of one division on its scale. However, it is relatively simple to calibrate bubbles because they can be mounted at the "short" end of a lever and the angle measured with a micrometer and the "long" end of the lever. In the instrument itself the length of the rotating leg must be determined very carefully. At the University of Illinois the whole instrument was checked against a Brown & Sharpe micrometer fitted with a dial reading to 0.0001 in. The range of a bubble instrument was 0.0004 in. total movement. In this connection it may be noted that not all bubbles will be found to have a calibration curve suitable for instruments of this kind.

As noted previously the multiplication of this instrument as used at the University of Illinois was 3300 times. It may be noted that the multiplication of an ordinary dial micrometer strain gage is about 250 times. The instrument was used with a 4-in. gage length; but its sensitivity would allow it to be used with a much smaller gage length, though the problem of supporting it in place might be somewhat more difficult.

This bubble extensometer is a highly sensitive strain gage, suitable for the study of small strains in specimens, machine parts or structures, in which the gage lines can be laid out in a horizontal direction. The accuracy obtainable with the instrument depends not only upon its calibration but the care taken in its use. For the use made of the instrument the accuracy seemed to approach a value close to the sensitivity.

Surface Cracks on Large 18 per cent Chromium, 8 per cent Nickel Alloy Steel Castings[1 a]

By Peter R. Kosting[2]

SYNOPSIS

Castings of 18 per cent chromium, 8 per cent nickel alloy steel with large cross-section are apt to have intergranular cracks starting at their surfaces and penetrating up to $\frac{3}{8}$ in. Free machining analyses are more prone to have these cracks than regular grade. Etching is usually required to reveal the cracks. It is suggested that fine-grain castings will not be prone to such cracking if cooled either quickly or very slowly, and that they may exhibit such cracks if cooled at an intermediate rate. The benefit of quenching such large castings from high temperatures is limited to a very thin skin which may be easily removed during fabrication.

Intergranular cracks were detected after macroetching for certain inspection purposes, on the surface of large stainless castings of the 18 per cent chromium, 8 per cent nickel steel type. Such cracks are not generally observed in small castings. Evidently they are more prone to be found in the non-seizing or free-machining grade of 18-8 than in the regular grade. This report describes these cracks and records some miscellaneous observations made on a limited number of castings.

MATERIAL

The castings were obtained on Navy Department Specification 46S27, grades 1 and 7, of November 1, 1934.[3] The analyses of two typical castings, which are herein described, are given in Table I.

The castings had been quenched from 1065 to 1120 C.

TABLE I.—ANALYSES OF STAINLESS CASTINGS OF 18 PER CENT CHROMIUM, 8 PER CENT NICKEL TYPE.

	Casting A, Grade 1[a]	Casting B, Grade 7[a]
Carbon, per cent	0.07	0.13
Chromium, per cent	21.38	20.7
Nickel, per cent	12.76	11.0
Silicon, per cent	1.80	0.89
Manganese, per cent	0.49	0.32
Sulfur, per cent	0.022	0.012
Phosphorus, per cent	0.008	0.018
Selenium, per cent	nil	0.29

[a] "Steel, Corrosion-Resisting: Castings," Navy Department Tentative Specification 46S27, November 1, 1934.

(1950 to 2050 F.) to dissolve and hold in solid solution the carbides, in strict accordance with specification requirements.

The tensile properties of test coupons, and of bars taken from one of the castings itself, are given in Table II.

The weights of these castings were around 1000 lb. and the sections varied from 1 to 8 in.

The molds were dry-baked sand. The metal was poured relatively hot for casting B and cold for casting A. The castings were removed from the mold at a dull red heat.

MACROSTRUCTURE

Intergranular cracks on the macroetched surfaces of both castings from portions originally about 6 in. in cross-section are shown in Fig. 1. Figure 2 shows another macroetched surface of casting B. The large grain size is plainly noticeable. The soundness of the cross-section of casting B is shown in Fig. 3. The depth of penetration of one of the surface cracks is shown in Fig. 4. No crack was found deeper than $\frac{3}{8}$ in., most cracks run up to $\frac{3}{16}$ in. deep.

Figure 5 shows the result of a macroetch superimposed upon a "residue etch" wherein the sample was made anode in a ferrous sulfate solution, as is done in Fitterer's[4] method of extraction of inclusions from steels. The absence of pitting at the outside edge, which is on the right of the figure, compared with midsection is notable.

MICROSTRUCTURE

The microstructure of these castings is shown in Fig. 6. On the outside edge of casting A, the carbides at the grain

[a] Presented at the Forty-first Annual Meeting, Am. Soc. Testing Mats., Atlantic City, N. J., June 27-July 1, 1938.

[1] Released for publication by the Chief of Ordnance, U. S. Army. Statements and opinions are to be understood as individual expressions of their author, and not those of the Ordnance Dept.

[2] Chemical Engineer, Watertown Arsenal, Watertown, Mass.

[3] "Steel, Corrosion-Resisting: Castings," U. S. Navy Department Tentative Specification 46S27, November 1, 1934.

[4] G. R. Fitterer, "Method of Electrolytic Extraction of Inclusions from Steel," *Transactions*, Am. Inst. Mining and Metallurgical Engrs., Iron and Steel Division, Vol. 95, pp. 196-208 (1931).

(a) Casting A, grade 1 (× 1.8)

(b) Casting B, grade 7 (× 5.2)

Fig. 1.—Macroetched Surfaces of 18 per cent Chromium, 8 per cent Nickel Alloy Steel Castings

(Reduced one-half in reproduction)

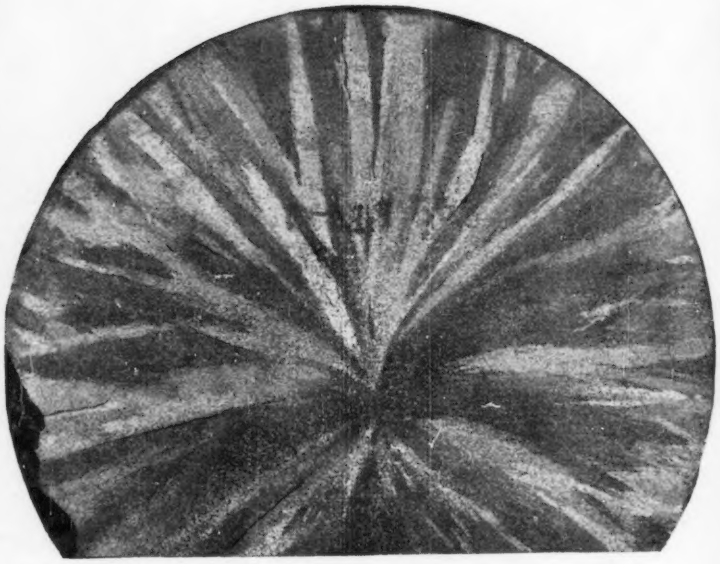

Fig. 2.—Macroetched Surface of Casting B, Grade 7 (× 1)

(Reduced one-half in reproduction)

Fig. 4.—Depth of Penetration of Surface Cracks in Casting B (X 3)

Note two planes 90 deg. to each other, as cast surface on left, plane of cross-section on right.

FECl + HCl etch

(Reduced one-half in reproduction)

Fig. 3.—Cross-Section of Casting B, Grade 7, After Macroetching (× 1)

Note two planes 90 deg. to each other

(Reduced one-half in reproduction)

Fig. 5.—Macroetch Superimposed upon Electrolytic Residue Etch Showing Pitting Except in Thin Skin Along Outside Edge Which Is on the Top. Casting A, Grade 1 (× 1.5)

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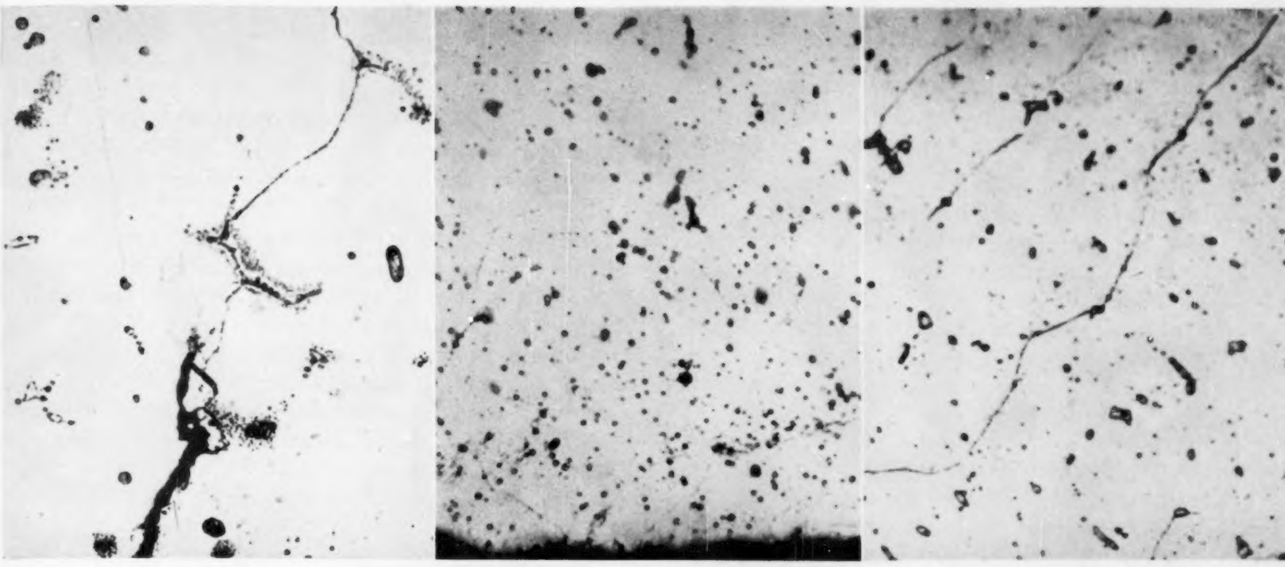


(*a*) Crack and continuous carbides at grain boundary. Casting B, grade 7, quenched from 2000 F.

Outside edge, discontinuous carbides at grain boundaries

Mid section, continuous carbides at grain boundaries

(*b*) Casting A, Grade 1, quenched from 2000 F.

Fig. 6.—Microstructure of 18 per cent Chromium, 8 per cent Nickel Alloy Steel Castings. Oxalic acid etch (× 100)

boundaries are discontinuous, whereas at midsection, the carbides are continuous. In casting B, the grain boundary constituent is practically continuous. The cracks are definitely intercrystalline though they will follow any segregate that lies on the boundary. Diffusion probably of the carbon from such segregates had started.

TABLE II.—TENSILE PROPERTIES OF STAINLESS CASTINGS A AND B.

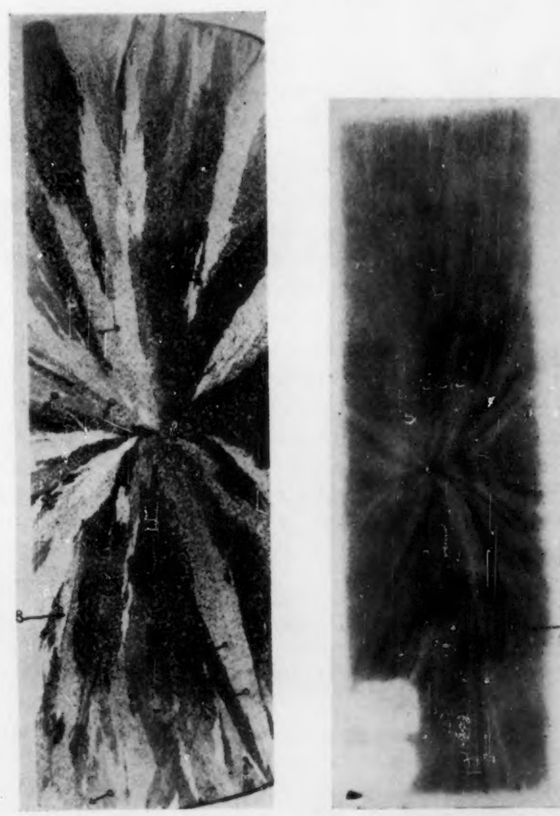
	Casting A	Casting B	
	Test Coupon	Test Coupon, Test made at Inspector's Laboratory	Casting, Test Made at Watertown Arsenal, Specimen taken $1\frac{3}{4}$ in. from surface
Yield point, lb. per sq. in.....	35 000	41 125	39 000
Tensile strength, lb. per sq. in.	71 750	78 875	71 600
Elongation, per cent........	60.0	58.0	40.0
Reduction in area, per cent..	70.9	51.0	48.6
Tensile Notch, Charpy, ft-lb.	....	....	52.4

CRACKS

The cracks observed after etching are usually very fine and usually are not detectable by X-rays.

The exograph taken through a slab, $\frac{1}{2}$ in. thick, of casting B after macroetching has been described.[5] The photograph of the outside surface of the macroetched slab which was radiographed to obtain this exograph is shown in Fig. 7, in which arrows show the location of cracks. Beneath this photograph is shown the exograph of the same slab taken before macroetching in such a manner that the outside surface as shown was adjacent to the film during exposure to the X-rays. The photograph of the disk and its exograph are, therefore, like mirror images.

At only one place in the exograph was a crack detected, the position of which is indicated by an arrow.



(*a*) Surface of casting after macroetching (× 1.1)

(*b*) Exograph taken before macroetching (× 1)

Fig. 7.—Slab $\frac{1}{2}$ in. Thick, from Surface of Casting B

Exograph taken with surface of slab shown on left side of figure adjacent to the X-ray film. These views are like mirror images.
Arrows show cracks
(Reduced one-half in reproduction)

[5] H. H. Lester, "The Problem of Radiographic Inspection," Symposium on Radiography and X-ray Diffraction Methods, p. 160, published by the American Society Testing Materials (1936). (Symposium available as separate publication.)

The exograph is peculiar and interesting. The thinner the slab, the more difficult it appears to be to obtain such striated exographs. The striations follow closely the coarse cast structure, as revealed on macroetching.

BOILING ACID COPPER SULFATE (STRAUSS) TEST

Metal taken from the midsections of the heat-treated castings failed upon bending after being corroded for 72 hr. in boiling acid copper sulfate solution (H_2SO_4 10 per cent, $CuSO_4$ 3 per cent, H_2O 87 per cent). Heating a sample, 1 by 1 in. in section, to 2000 F. and water quenching, improved the metal so that no cracking occurred on bending after corrosion. Heating the ½-in. slab described in Fig. 7, to 2000 F. for 2 hr. and oil quenching did not dissolve all the carbides at the grain boundaries.

OTHER OBSERVATIONS

The use of a colored kerosine-oil solution to locate cracks prior to macroetching was tried, but with negative results. Study of the surface after fine grinding did not show the location of cracks. Only after etching with an electrolytic oxalic acid etch[6], or a $FeCl_3$ + HCl etch[7] or a H_2SO_4 + HCl (Watertown) macroetch[8] did cracks show up. However, on other castings such cracks have been observed on the original surface.

DISCUSSION

All castings described herein had been reheated to high temperatures and quenched. It is believed that such cracks can be found in castings prior to heat treatment.

No internal cracks or "inner checking" were observed, such as may be attributable to the phenomenon described by Hall[9], and which limited the size of the original Hadfield's manganese steel castings to a maximum section of 4½ to 5 in.

The explanation offered to account for the cracking observed is based upon the high expansivity and low thermal conductivity of such alloy steels and the low ductility that some such alloys possess at temperatures around 870 to 980 C. (1600 to 1800 F.) especially if time of deformation is long[10] as shown by Strauss and Schafmeister. Such coarse structures favor low ductility, also. As the casting cools in the mold, the skin contracts faster than the midsection so that it is in tension. The slower the cooling, the greater will be the loss in ductility, but the lower will be the tensile force due to differential cooling between the inside and outside of the casting. There is a balance here. If stresses of a sufficiently high order are set up in the proper high-temperature range, brittle fracture will occur, the fracture following the grain boundary. At other temperatures, there is sufficient ductility to prevent the building up of high stresses. It follows that fine-grained castings will not exhibit such cracks if cooled either quickly or very slowly, and that they may exhibit such cracks if cooled at an intermediate rate which is critical. The concept of "potential cracks," which are revealed as cracks after etching or by some other means, awaits development.

Study of Fig. 5 is interesting. The benefit of heat-treating castings of 6-in. section is limited to a very thin surface layer or skin, so thin that it would be removed during processing to remove the last trace of oxide, scale, etc. Specifications should, therefore, limit the cross-section of 18 per cent chromium, 8 per cent nickel alloy steel castings that are to be heat treated for improved corrosion resistance. The A.S.T.M. Specifications for 20 per cent Chromium, 9 per cent Nickel Alloy Steel Castings (A 198 – 36 T)[11] limit the cross-section of such castings to 3 in.

The facts that are described are not sufficient to explain properly the whole phenomena. Much further work is necessary. As "consumers" of this class of alloy, it was felt that Watertown Arsenal was not justified in carrying out further studies.

Acknowledgment:

The cooperation of the personnel in the shops and in the laboratory of Watertown Arsenal, and of many producers of stainless castings, is acknowledged.

[6] George A. Ellinger, "Oxalic Acid as an Electrolytic Etching Reagent for Stainless Steels," *Transactions,* Am. Soc. Metals, Vol. 24, p. 26 (1936).

[7] J. R. Vilella, "The Polishing and Etching of Iron Chromium and Iron Chromium Nickel Alloys," *Proceedings,* Am. Soc. Testing Mats., Vol. 34, Part I, p. 193 (1934).

[8] Michael G. Yatsevitch, "Essential Factors in Conducting the Macroetching Test Under Usual Practice Conditions of Production Work," *Transactions,* Am. Soc. Steel Treating, Vol. 21, p. 310 (1933).

[9] J. H. Hall, "For to Catch a Whale," *Metals and Alloys,* Vol. 5, p. 221, (1934).

[10] Discussion by B. Strauss and P. Schafmeister of paper by H. D. Newel, "Influence of Grain Size on the Properties and Corrosion Resistance of the 18-8 Iron Chromium Alloy for Elevated Temperature Service," *Transactions,* Am. Soc. Steel Treating, Vol. 19, p. 737 (1931).

[11] *Proceedings,* Am. Soc. Testing Mats., Vol. 36, Part I, p. 639 (1936); also 1937 Book of A.S.T.M. Tentative Standards, p. 174.

DISCUSSION

MR. R. J. WILCOX[1] *(presented in written form).*—The reported investigation by Mr. Kosting of crack systems and surface cracking in large 18 per cent chromium, 8 per cent nickel alloy castings is a contribution in explanation of a phenomenon both serious and troublesome to producers of large stainless castings of the 18 and 8 analysis. While the author's explanation of such cracks indicates that the tendency to rupture is dependent on the cooling rate of the casting in the mold and the primary grain size of the metal, there also appears to be evidence that the conventional specified heat treatment for carbide solution is conducive to surface cracks in large castings. It has been our experience in several instances that large 18-8 castings which were apparently free from surface cracks in the as-cast condition, indicated small surface checks after quenching in water from 1950 to 2050 F.

Mr. Kosting has strikingly indicated the deficiencies of heat treatment in effecting carbide solution in castings of 6 in. or over, indicating that on sections that are to be machined, the very small surface layer of metal which has effectively retained carbides in solution may be removed, thus exposing material of doubtful physical composition for resistance to severe types of corrosive attack.

We have recognized for some time that such conditions are prone to exist in large 18-8 castings and wherever possible we have used a composition containing approximately 29 per cent chromium, 9 per cent nickel, 0.25 per cent carbon. This composition may be used in the as-cast condition for practically all corrosion-resisting applications for which

[1] Chief Metallurgist, Michigan Steel Casting Co., Detroit, Mich.

the austenitic chromium-nickel alloy is adaptable with the further advantage that due to a slightly higher carbon content it may be poured at relatively lower temperatures, both of which conditions are conducive to finer grain structures and greater freedom from cracking.

MR. PETER R. KOSTING *(authors' closure, by letter)*.—One would anticipate on the basis of the explanation offered that reheating such casting to a high temperature followed by cooling at the critical rate would cause cracking. There must be many factors affecting the critical rate of cooling, including type analysis, grain size, grain boundary films and segregates, melting technique, and so on. These factors must also affect each other to a variable degree. The analysis given by Mr. Wilcox, which is less prone to the difficulties described in my paper, will be information welcomed by many I am sure.

A Method for Measuring the Fluidity of Dispersions of Cellulose in Cuprammonium Solution[1]

By R. T. Mease[2]

IN any precise study, one soon discovers there is very little that can be done to cellulose fibers without producing some fundamental change. It is quite generally recognized that chemical processing produces changes in these fibers, but it must be recognized also that processes sometimes considered purely mechanical in nature also leave their mark. It has been observed that grinding cellulose produces a change attributable to a lowering of the degree of polymerization.[3]

The purpose of the finisher is to modify the textile to meet the desires of the consumer for whom it is intended. It may be modified with regard to color, by bleaching or dyeing; it may be stiffened by sizes or made more pliant by softeners; it may be shrunk for some purposes or stretched for others. But always the consumer wants a strong durable product.

In the fluidity of dispersions of cellulose in cuprammonium solutions, the textile technologist has a measure of fundamental changes in textile fibers of vegetable origin, which are closely related to fiber strength and susceptibility to deteriorative influences. The measurements can be made precise for detecting small changes; they respond to all types of cellulose degradation; they can be applied either to dyed or undyed material; and are particularly useful in detecting changes in the earlier stages of degradation which are of special interest to the textile finisher.

At the request of Subcommittee B-4 on Bleaching, Dyeing and Finishing of Committee D-13, this paper has been prepared describing our efforts at the National Bureau of Standards to standardize the measurement of the apparent fluidity (or viscosity) of cellulose in cuprammonium solution, and further, to describe very briefly the technique and equipment which we have found practical and dependable for making what may be called routine fluidity measurements. A more detailed description of the method in use is being prepared for publication in the *Journal of Research* of the National Bureau of Standards.

The quantitative determination of the fluidity of these dispersions is, like many such determinations, a long series of manipulations where lack of critical attention may result in complete failure and loss of many days' work. It is not intended to overemphasize the difficulties experienced in trying to adapt fluidity measurements to laboratory use in the diagnosis of changes in cellulose fibers. They will probably become apparent from a description of what have been found to be necessary precautions.

For the purpose of description, one may consider the work of standardizing the method for making fluidity measurements as consisting of three phases: (1) The preparation of standard cuprammonium solution and its storage under such conditions that it will be available for use at all times, without deterioration or change of concentration; (2) The construction and calibration of suitable viscometers; (3) The dispersion of the cellulose and the observation of certain flow characteristics of the resulting solutions.

THE STANDARD CUPRAMMONIUM SOLUTION AND ITS PREPARATION

Cellulose of high degree of polymerization is more difficult to disperse and yields a lower fluidity than degraded cellulose, or cellulose of lower degree of polymerization.

The power of cuprammonium solution to disperse cellulose and the apparent fluidity of the resulting cellulose dispersion are determined in part by the concentration in the solution of ammonia, copper, and nitrates and nitrites formed during its preparation. Therefore, solutions of the same composition must be used if comparable results are to be had either in the same laboratory or in different laboratories. A solution relatively high in ammonia content seems to be a better dispersing agent than a similar solution lower in ammonia concentration. The solution described by Clibbens and Geake[4] permits the dispersion of cotton cellulose which yields a fluidity of only 1 to 2 rhes in a 0.5 per cent solution.

This solution, containing 240 $\pm$ 5 g. of ammonia per liter, 15 $\pm$ 0.1 g. of copper and less than 0.5 g. of nitrites and nitrates calculated as nitrous acid, is prepared by

[1] Publication Approved by the Director of the National Bureau of Standards of the U. S. Department of Commerce.

Presented at the Spring Meeting of A.S.T.M. Committee D-13 on Textile Materials, March 9 to 11, 1938, Washington, D. C.

[2] Chemist, National Bureau of Standards, Washington, D. C.

[3] H. Standinger and E. Dreher, "Uber das Zerreissen von Faden-Molekulen der cellulose beim Vermahlen," *Berichte* der deutschen Chemischer Gesellschaft, No. 69, p. 1091 (1936).

[4] D. A. Clibbens and A. Geake, "Measurement of the Fluidity of Cotton in Cuprammonium Solution," *Journal* Textile Inst., Vol. 19, p. 77T (1928).

bubbling air saturated with ammonia into a cold agitated mixture of concentrated ammonium hydroxide, powdered copper, and cane sugar. The process is continued until the solution contains a little more copper and ammonia than is required. The solution is then carefully analyzed and adjusted to the proper composition. It is stored in a container with the space above the liquid filled with nitrogen and kept cold in an ordinary household refrigerator. Solutions kept in this manner for one year have not measurably changed. No difficulty has been experienced in following the prescribed directions for its preparation and the resulting solutions have met the requirements as to composition.

Equipment which is convenient for preparing the solution is illustrated in Fig. 1, and equipment for preserving the solution and keeping it available for use at all times is shown in Fig. 2.

CHOICE OF VISCOMETER, ITS CONSTRUCTION, AND CALIBRATION

When measurements of the fluidity of cuprammonium solutions of cellulose are to be made, several factors determine the choice of type of viscometer to use. Cellulose is slowly dispersed by cuprammonium solution. The solution is unstable when exposed to light or air. The viscometer must permit safe handling of this solution and in addition should be simple, inexpensive to construct and calibrate, and of satisfactory and fairly uniform sensitivity throughout the range of fluidities represented by the high grade cotton celluloses, rayons, and the chemically degraded celluloses. Further, since the solution to be measured is not a simple liquid in that the rate of shear is not proportional to the shearing stress, the viscometer should be of a type and of dimensions that can be duplicated from time to time to allow comparable measurements within practical limits of precision.

These requirements seem to be met best by the viscometer recommended by the Fabrics Research Committee of the Department of Scientific and Industrial Research (British) illustrated in Fig. 3. The viscometer is simple to construct. It consists essentially of a glass tube with calibration marks placed at proper intervals, with a capillary discharge tube

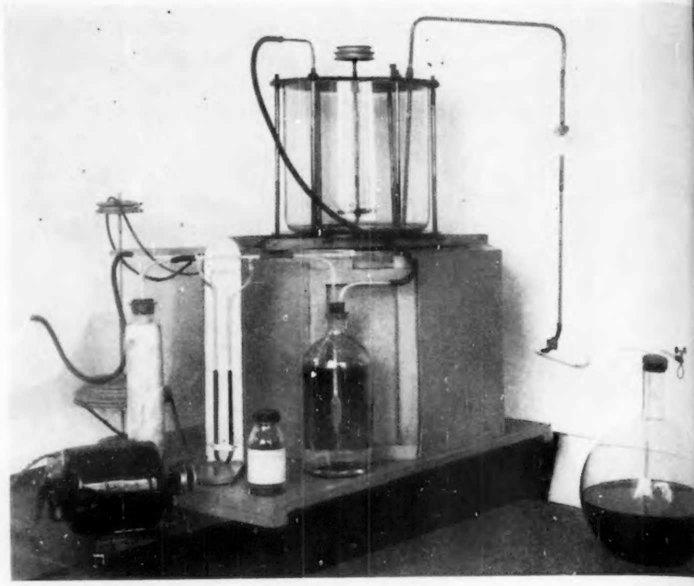


Fig. 1. Apparatus for the preparation of standard cuprammonium solution. pacity 12 liters of standard solution. The solution is prepared in the large cylinder fitted with stirrer and air-intake tube. This cylinder is lowered in the sulated metal container and packed with ice during the preparation.

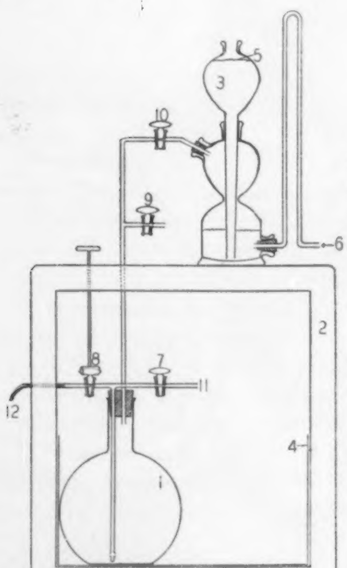
sealed to one end. The solution to be measured is placed in the viscometer, the temperature controlled, and the time required for the meniscus of the liquid to travel from the upper to the lower calibration mark is observed with the viscometer in a vertical position while the liquid flows under the force of gravity.

From the density of the liquid, the observed time of flow and instrumental constants determined by calibration, the apparent fluidity in rhes is calculated from the formula:

$$\text{Fluidity} = \frac{Ct}{d(t^2 - K)}$$

in which C and K are instrumental constants, d is the density of the liquid in grams per cubic centimeter, and t the time of flow in seconds.

The viscometer is calibrated by observing the time of flow of a simple liquid the fluidity of which is accurately



1. 12-liter pyrex flask
2. Refrigerator wall
3. Kipp's generator
4. Copper tank
5. Level of liquid in charged Kipp's generator
6. Inlet for nitrogen
7. Stopcock for filling
8. Stopcock for tapping
9. Stopcock to release pressure in flask when filling
10. Stopcock to control flow of nitrogen
11. Filling tube

Fig. 2. Equipment for storing standard cuprammonium solution in a dark, cold chamber, with air excluded from the containing vessel.

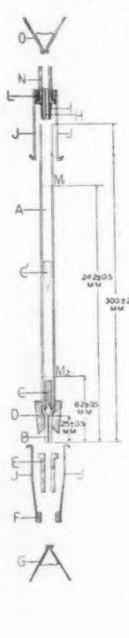


Fig. 3. Viscometer and accessories.

A—Body of viscometer
B—Capillary discharge tube 0.88 ± 0.02 mm inside diameter.
C—Steel plunger
C[1]—Side view of plunger
D—Rubber stopper
E and N—Flanged rubber tubes
OG[1]—Clips
H—Glass capillary tube
I—Rubber stopper
J—Metal hooks to take rubber bands
FL—Metal Collar
M_1 M_2—Calibration markings

known. Water solutions of glycerol which may be prepared to give any desired fluidity between that of glycerol and that of water have been used for the purpose. These solutions have the disadvantage of being hygroscopic, hence subject to change because of losing or acquiring moisture from the atmosphere. Benzyl alcohol and phenyl ethyl alcohol have the same disadvantage though they are less troublesome than glycerol. When using these liquids for calibration they need to be checked, purified, or freshly prepared just before use.

A more convenient way is to reserve a viscometer of the type described for reference only and carefully calibrate it with oil of predetermined fluidity. Suitable oil is obtainable from the National Bureau of Standards. With such reference viscometers, calibrating liquids or solutions of any kind can be measured at any time desired with the same precision and accuracy attainable with the same type of viscometers and methods used in determining the apparent fluidity of the cellulose dispersions.

DISPERSION OF CELLULOSE AND OBSERVATION OF ITS FLOW

A decided advantage of the capillary type of viscometer is that it serves as the vessel for dispersing the cellulose in the absence of air. The glass body of the viscometer, *A* in Fig. 3, is provided with a capillary discharge *B* at its lower end. The flanged rubber tube *E* is placed over it and the rubber tube is closed with a pinch clamp *G*. A steel plunger is provided which is wedge shaped at one end as illustrated at *C′*; with the edge notched as shown at *C*. The plunger at *C′* has been rotated 90 degrees on its longitudinal axis as compared with its position at *C*. The plunger is placed in the viscometer with its notched end toward the capillary discharge tube. The viscometer is then about half-filled with cuprammonium solution, a portion is drained through the discharge tube, the cellulose is introduced, and the tube is filled to the top with cuprammonium solution. It is then closed with the stopper *I* having a glass capillary tube *H*, and flanged rubber tube *N*. The excess cuprammonium solution rises in the capillary and the rubber tube *N*. The latter is then closed with the pinch clamp *O*. Thus the viscometer is completely filled and air displaced. The viscometer is filled at point 12, see Fig. 2.

The stoppers are held in place on the viscometer by metal rings *F* and *L* with wire hooks *J* the upper hooks being attached to the lower with rubber bands. It has been found advantageous to place a rubber reinforcement *D* on the viscometer where the tube joins the capillary. Objections have been raised to the use of the steel plunger because of breakage of the glass tube, but no breakage has resulted in our work when the rubber reinforcement has been used.

After filling, the viscometer is placed on a wheel, protected from light and rotated end over end at about 4 r. p. m. until dispersion is complete. For cellulose difficult to disperse it is usually convenient to rotate the wheel over-night. Preferably during the first hour and the last two or three hours, the wheel is occasionally stopped and the viscometer rotated about its longitudinal axis. This insures that the plunger will remove the swollen cellulose which may adhere to the walls of the tube.

Some laboratories use mercury in place of the steel plunger to agitate the mixture. We have found this unsatisfactory in dispersing high-grade cellulose. The mercury tends to form channels and homogenous dispersions are not always obtained. Even with the steel plunger, we have found it advisable to rotate the tubes from time to time to insure complete dispersion of the cellulose.

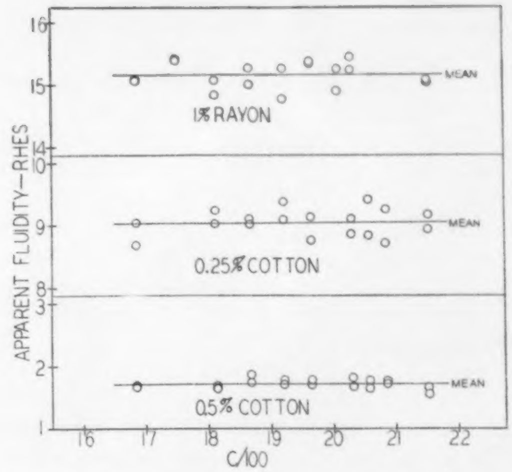


FIG. 4. Data illustrating the duplicability of results of measurements with the same viscometer, and with similar viscometers which differ in instrumental constants. The results for two concentrations of cotton and one of rayon are given. The straight line represents the arithmetic mean fluidity of each group.

After dispersion is complete, the viscometers and contents are immersed in a water bath. They are permitted to reach the temperature of the bath and the time of flow of the liquid measured.

PRACTICAL DUPLICABILITY OF FLUIDITY MEASUREMENTS

Celluloses which have received no drastic chemical treatment or which have not been degraded by the action of light or other deteriorative influences, produce dispersions of relatively low fluidity for a given concentration. They represent the kind of cellulose dispersions which differ most from simple liquids.

The small variations between different viscometers may be expected to affect the results for dispersions of such high grade cellulose more than for dispersions of celluloses of a lower degree of polymerization. Celluloses of these kinds, one in the form of high-grade cotton and another of rayon manufactured by the cuprammonium process, were measured with viscometers differing considerably in instrumental constants. The samples of cellulose fiber were first given a mild cleansing treatment to remove oils and waxes.

Nine viscometers, including the one with the highest and the one with the lowest instrumental constants, were chosen from a group of 18 constructed in the laboratory with moderate skill and care. The "*C*" constants differed from 1687 to 2153 and the "*K*" constants from 421 to 526. Duplicate measurements at 21 C. were made with each viscometer on solutions containing 0.5 per cent and 0.25 per cent cotton, and 1 per cent rayon. The results are shown in Fig. 4. It can be seen that the difference in results due to a change in viscometers is small in comparison with the difference between two successive tests on the same instrument. Consequently, greater precision in the duplication of the viscometers than is represented by the nine compared here is unnecessary for comparable measurements of the apparent fluidity of cuprammonium dispersions of cellulose.

ASTM BULLETIN

Published by

AMERICAN SOCIETY FOR TESTING MATERIALS

No. 93 **August, 1938**

Two Requests from the President

This is a personal message to each of you who is a member of the Society. It makes two requests. The first is that you take time enough to read this message twice.

The success of any enterprise depends upon the intelligence and the amount of effort put forth by those participating. Particularly in such an enterprise as the American Society for Testing Materials, it is highly desirable that each member participate actively. Your duty is not fulfilled merely by paying dues and by electing an Executive Committee. The Society is yours, its policies must be those which you set up. The Executive Committee is merely your agent, administering Society affairs, technical and otherwise, as you may direct. Your help in technical matters is, of course, indispensable and has been given in generous measure. In broader matters, too few of you participate.

This leads to my second request: namely, that you write me presenting your ideas as to how the Society may be made more useful to you, to industry, and to the public. What proposal can you make to the Executive Committee along the line of improving what we now have or of adding to our useful activities?

T. G. Delbridge
President

Discussion — Necessary

This news note has the primary purpose of announcing that written discussion of the papers and reports presented at the 1938 annual meeting will be received by the Committee on Papers and Publications until September 1. All who plan to submit discussion are urged to send it to Society Headquarters as far in advance of the closing date as possible in order to facilitate the preparation of the material for the *Proceedings*.

But while on this subject of discussion, it may be well to consider very briefly the significant part it plays. A considerable percentage of the Society publications comprising papers is devoted to discussion and it is not unusual to find that a technical symposium, for instance, may have one-third or so of its contents comprising comments or critical reviews of the basic papers. Each author of a paper before the Society is expected to submit a list of those who should be interested in discussing his paper; these individuals are contacted and urged to study the paper and express their reaction to it. At the Society sessions, the chairmen frequently stimulate discussion by calling on recognized authorities in the audience.

While discussion is accepted as a rather routine thing, it is well to stress occasionally its extreme importance. If we look into the derivation of the word "discussion" we find that it comes from the Latin meaning "to shake apart." While much discussion is of a critical nature and may involve considerable "shaking," that is only one of its important purposes. A great deal of that published by the Society presents additional data and information on the topic. It may not be of a critical nature at all.

Every engineer vitally interested in a problem owes it to the industry he represents and to all those vitally concerned with the materials field to present orally or in written form discussion of a paper or report, if he has something worth while to add. In general, it is welcomed by authors, for progress in the materials field can go forward safely and progressively only after very searching analyses of a particular topic.

Heat of Combustion

Some time ago Committee E-8 on Nomenclature and Definitions was asked to consider the proper term to be used in connection with the determination of the heating value of a fuel. Several terms have been used in the past: calorific value, because a calorimeter is employed in the determination; B.t.u. value, because results have been frequently reported in B.t.u.; thermal value, heating value, etc. The task of selecting the proper term was assigned to the Subcommittee on Definitions of Net and Gross Calorific Values of Fuels, under the chairmanship of H. C. Porter. While the subcommittee is rather inclined to use the term "calorific value" in view of its wide acceptance, the committee is not at all a unit in this, since several members of the committee favor the use of the term "heat of combustion" as being perhaps more accurate. The term "calorific value" has been adopted by the British Standards Institution and is similar to "pouvoir calorifique" of the French and to "heizwert" used in the German standards.

The comments of one of the members on this subject should be of particular interest:

"While it is true that terminology may not be of prime importance and it is more important to be consistent than to be correct, I feel still that the subject of heat of combustion *versus* calorific value is worthy of further thought. The mere fact that calorific value appears to have somewhat the advantage in present usage is not a particularly good reason why it should be adopted in preference to a wording which is possibly in almost as common use and which is distinctly superior for the purpose.

"While 'calorific value,' 'pouvoir calorifique' and 'heizwert' are all parallel, they quite distinctly reflect the attitude of the mind before

the thermal chemical problems were as well understood as they are at present. Undoubtedly the object of experiments on heats of combustion was to determine the 'calorific power' or heating effect of fuels. The thing which is actually measured is simply the 'heat of combustion.' Whatever other elements come into the problem are not subject to measurement. It seems therefore quite clear that we shall be on a much better logical basis in using a term which defines quite closely the thing which we actually measure, i.e. the heat of combustion as such.

"Considering all the phases of the problem, it seems to me that the only valid argument for the use of calorific value is its apparent greater popularity at the present time. Over against that, the term heat of combustion is not only more logical and represents more accurately the thing which is measured, but is also a simpler term to use and more readily understood by all of those who may be concerned with it."

Comments of members of the Society and others interested in this problem are solicited. Shall the term "calorific value" be standardized or shall it be "thermal value," "heat of combustion or heat value," or, as has been suggested, "calorific value (heat of combustion)"?

Publication on Protecting Metals Against Corrosion

THE very considerable interest evidenced by many of those attending the district meeting held in Detroit on April 19 at which a technical Symposium on Protecting Metals Against Corrosion was held, and by many others concerned with this subject, has led to the decision to issue in the form of a special publication the four papers presented. This meeting was one of the best attended district meetings yet sponsored and there were many favorable comments on the papers. A list of these and the authors follow:

- Corrosion-Resistant Alloys—H. W. Gillett, Metallurgist, Battelle Memorial Institute
- Protection of Base Metals by the Use of Metallic Coatings—C. E. Heussner, Materials Engineer, Chrysler Corp.
- The Pre-Treatment of Metals—R. J. Wirshing, Research Engineer, General Motors Corp.
- Corrosion Protection by Means of Organic Coatings—J. L. McCloud, Metallurgical Chemist, Ford Motor Co.

It is believed that many members of the Society will be interested in obtaining copies of this symposium which will comprise 32 pages and a special order blank is being sent to each member. The price is 50 cents per copy, 35 cents to members.

Bibliography on Spectrochemical Analysis

THERE is to be issued by the Society a special publication comprising an extensive bibliography and index to the literature on spectrochemical analysis. This publication, recommended by Committee E-2 on Spectrographic Analysis should be of widespread interest and assistance to all who are concerned with this subject or interested in it. The bibliography has been prepared and offered to Committee E-2 by Dr. W. F. Meggers, Chief, Spectroscopy Section, with B. F. Scribner, both of the National Bureau of Standards.

The bibliography consists of a list of references to papers, books, and tables applying directly to the spectrochemical analysis of materials by emission spectra, including methods of analysis and actual applications to metallurgy, agriculture, biology, medicine, chemistry, etc. In addition, selected references on photometric methods of intensity measurement, and references to recent catalogs, A.S.T.M. methods and similar works will be included. The period covered will be 1920 to 1937, inclusive, and as published the some 60-page booklet will include a brief introduction, some 930 literature citations and a detailed index. The index should be extremely helpful since it will permit ascertaining quickly a list of papers on a given subject.

A convenient order blank is being sent in a separate mailing to each member of the Society so that copies of this publication can be reserved. A price of 75 cents per copy has been set for the members; list price $1.00.

The publication date has not been definitely fixed, but it is expected to be available early in October.

SOCIETY APPOINTMENTS

Announcement is made of the following appointments:

N. L. MOCHEL, Chairman of Committee A-1 on Steel, Metallurgical Engineer, Westinghouse Electric and Manufacturing Co., as the American representative on ISA Committee No. 17 on Iron and Steel.

H. J. BALL, Chairman of Committee D-13 on Textile Materials, Professor of Textile Engineering, Lowell Textile Institute, as American representative on ISA Committee 38 on Textiles; and S. COLLIER, Staff Manager, Inspection and Control Dept., Johns-Manville Corp., and W. E. EMLEY, Chief, Division of Fibrous and Organic Materials, National Bureau of Standards, as representatives on ISA Committee 45 on Rubber Products.

F. C. WELCH, Chemist, Western Lime and Cement Co., as A.S.T.M. representative on A.S.A. Sectional Committee A-42 on Specifications for Plastering.

H. F. MOORE, Professor of Engineering Materials, University of Illinois; W. H. FULWEILER, Consulting Chemist; and P. G. McVETTY, Mechanical Engineer, Research Laboratories, Westinghouse Electric and Manufacturing Co., reappointed to Committee E-1 on Methods of Testing.

C. M. CHAPMAN, Consulting Engineer, and R. P. ANDERSON, Secretary, Division of Refining, American Petroleum Institute, reappointed to Committee E-8 on Nomenclature and Definitions.

H. S. MATTIMORE, Engineer of Materials, Pennsylvania State Highway Dept., and R. P. ANDERSON, reappointed to Committee E-10 on Standards.

C. E. MACQUIGG, Dean, College of Engineering, Ohio State University, to Committee E-9 on Research.

R. W. CRUM, Director, Highway Research Board, National Research Council, as Society representative on the Division of Engineering and Industrial Research, National Research Council.

JAMES ASTON, Consulting Metallurgist, A. M. Byers Co., as A.S.T.M. representative on A.S.A. Sectional Committee B 31 on Code for Pressure Piping and B 36 on Standardization of Dimensions and Materials of Wrought-Iron and Wrought-Steel Pipe and Tubing.

H. J. JAQUITH, Minot, Hooper and Co., as the Society's representative on A.S.A. Sectional Committee L 4 on Specifications for Sheeting.

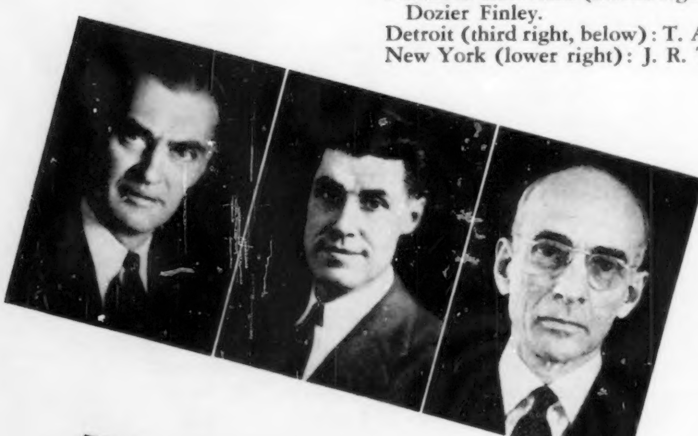
W. H. BASSETT, JR., Manager, Metallurgical Development, Anaconda Wire and Cable Co., representing Committee D-13, and W. H. GARDNER, Research Fellow, Shellac Research Bureau, Polytechnic Institute of Brooklyn, representing Committee D-1, on A.S.A. Sectional Committee C 59 on Electrical Insulating Materials.

W. S. HOUSEL, Associate Professor of Civil Engineering, University of Michigan, and Research Consultant, Michigan State Highway Dept., as the A.S.T.M. representative on the A.S.A. Sectional Committee on Building Code Requirements for Excavations and Foundations.

A.S.T.M. District Committee Officers

(Except for Pittsburgh, photographs are in the order (left to right)—Chairman, Secretary, Vice-Chairman.)

Pittsburgh (top left): F. M. Howell, *chairman;* Eugene Ayres, *secretary.*
Southern California (second left, above): F. M. Beckett, E. O. Slater, John Disario.
Chicago (third left, below): D. L. Colwell, C. E. Ambelang, J. de N. Macomb.
Cleveland (lower left): J. H. Herron, A. J. Tuscany, C. B. Murray.
Philadelphia (top right): N. L. Mochel, R. W. Orr, F. G. Tatnall.
Northern California (second right, above): F. M. Harris, T. P. Dresser, Dozier Finley.
Detroit (third right, below): T. A. Boyd, C. H. Fellows, J. L. McCloud.
New York (lower right): J. R. Townsend, G. O. Hiers, E. A. Snyder.



Members Appointed to District Committees

THE terms of office of a number of members of the eight A.S.T.M. District Committees expired with the 1938 annual meeting, in accordance with the charters governing the respective groups and the President has made the appointments listed below, all of these being for a term of three years. When developed initially the terms of office were from one to three years so that now about one-third of the district committee memberships must be appointed annually.

During the past year there have been several excellent meetings, with technical discussions, sponsored by District Committees and the groups have done considerable to stimulate interest in the Society in the various centers, assist in membership work, etc. On an adjoining page are photographs of the respective officers who will direct the work of the committees during the next two years.

District Committee Appointments
1938—1941

Chicago:
R. B. Harper, The Peoples Gas Light and Coke Co.
T. H. Rogers, Standard Oil Co. (Indiana)
*E. H. Davidson, Carnegie-Illinois Steel Corp.
*A. M. Johnsen, The Pullman Co.
*C. S. Neal, The Sherwin-Williams Co.
*A. H. Carpenter, Armour Institute of Technology.
*J. E. Ott, Acme Steel Co.

Cleveland:
F. D. Abbott, Johnson Rubber Co.
R. T. Bayless, American Society for Metals
J. H. Herron, The James H. Herron Co.
C. B. Murray, Crowell & Murray, Inc.
*F. L. Wolf, Ohio Brass Co.

Detroit:
F. O. Clements, General Motors Corp.
C. H. Fellows, The Detroit Edison Co.
W. H. Graves, Packard Motor Car Co.
C. E. Heussner, Chrysler Corp.
A. E. White, University of Michigan
*J. H. Walker, The Detroit Edison Co.
*A. J. Herzig, Climax Molybdenum Co. of Michigan
*V. M. Darsey, Parker Rust Proof Co.

New York:
*M. P. Davis, Otis Elevator Co.
*H. J. Jaquith, Minot, Hooper & Co.
*R. J. McKay, The International Nickel Co., Inc.
*L. T. Work, Columbia University
*T. A. Wright, Lucius Pitkin, Inc.

Northern California:
F. M. Harris, Pacific Gas and Electric Co.
R. A. Kinzie, Santa Cruz Portland Cement Co.
M. C. Poulsen, Civil Engineer

Philadelphia:
W. T. Pearce, The Resinous Products and Chemical Co.
*A. O. Schaefer, The Midvale Co.
*P. E. McKinney, Bethlehem Steel Corp.
*A. B. Bagsar, Sun Oil Co.

Pittsburgh:
E. H. Dix, Aluminum Company of America
Dean Harvey, Westinghouse Electric and Manufacturing Co.
Thomas Spooner, Westinghouse Electric and Manufacturing Co.
*F. M. McCullough, Carnegie Institute of Technology
*J. J. Paine, City of Pittsburgh
*P. G. McVetty, Westinghouse Electric and Manufacturing Co.

Southern California:
D. R. Merrill, Union Oil Co. of California
Harold Michener, Southern California Edison Co.
*F. J. Converse, California Institute of Technology
*H. W. Jewell, Pacific Clay Products
*R. A. Webster, Douglas Aircraft Co., Inc.

*New appointments; all others re-appointments.

The complete personnel of the District Committees will be listed in the 1938 Year Book.

District Meetings—Philadelphia, Pittsburgh

UNDER the sponsorship of the respective district committees in Philadelphia and Pittsburgh, meetings are to be held in these two cities during the Fall, the meeting in Philadelphia being scheduled for October 10, while the meeting in Pittsburgh is expected to take place on November 14. Further details of the latter meeting will be announced in the October BULLETIN.

At the meeting in Philadelphia on October 10 (place to be announced later) Dr. L. W. Chubb, Director, Research Laboratories, Westinghouse Electric and Manufacturing Co., will be the principal speaker. He has chosen as his subject "Fundamental Research in Industry," and he will stress a number of research applications in industry on a range of diversified subjects. Further details of this meeting will be sent to members in the Philadelphia area, but all members of the Society are cordially invited to attend. The District Committee is hopeful that as many of the members as possible will bring with them to this meeting their associates and other company executives who should be interested in the subject of Doctor Chubb's address and the general materials fields. Plans for the meeting are being made by the chairman and secretary of the district committee: N. L. Mochel, Metallurgical Engineer, Westinghouse Electric and Manufacturing Co., and R. W. Orr, Engineering Dept., RCA Victor Division, RCA Manufacturing Co.

The technical session featuring the Pittsburgh meeting will involve the presentation of three papers under the general subject "Examination of Materials by Microanalysis, Chemical Microscopy, and Chemical Spot Tests." Dr. W. R. Kirner, Coal Research Laboratory, Carnegie Institute of Technology, will speak on microanalysis; Dr. E. B. Ashcraft, Research Chemist, Westinghouse Research Laboratories, will speak on chemical microscopy; and Dr. Gordon H. Stillson, Research Chemist, Gulf Research & Development Co., will speak on chemical spot tests. These are all timely subjects of considerable interest. The general arrangements are being carried out by F. M. Howell, Engineer, Aluminum Research Laboratories, Aluminum Company of America, and Eugene Ayres, Staff Chemist, Gulf Research & Development Co., the new chairman and secretary respectively of the Pittsburgh District Committee.

Symposium on Rayon and Fibers at D-13 Meeting

ONE of the technical features of the Fall meeting of Committee D-13 on Textile Materials to be held on October 19 to 21 in New York City is a Symposium on Spun Rayon and Blended Fibers. This symposium is to be sponsored by the recently organized Section III on Rayon Staple and Spun Rayon Yarns of Committee D-13's Subcommittee A-2 on Rayon and Its Products. K. B. Cook, Vice-President in Charge of Manufacturing, Manville-Jenckes Corp., is chairman of this section. Papers are being developed to cover rayon staple manufacture, fabrication and merchandising, finishing, and test methods.

Because of the extensive use of spun rayon yarns, it is expected there will be considerable interest in this symposium. At the recent annual meeting there was approved for publication as tentative on the recommendation of Committee D-13, Methods of Testing and Tolerances for Spun Rayon Yarns and Threads and work is under way on methods of test and tolerances for rayon staple.

77 New and Revised Tentative Standards Approved; Withdrawals Listed for Members' Convenience

THE Society accepted at the annual meeting 68 new tentative standards and revisions of 59 existing tentative specifications and methods of test. Of the new tentative standards 18 are revisions of existing standards—these are indicated in the following list. Nine of the 59 revised tentative specifications and test methods represent extensive modifications. The titles of these are included below (marked with an asterisk) with the list of those issued by the Society for the first time. Standing committees responsible for the various items are indicated in italics. The number of new tentative standards is the largest that has ever been approved at an annual meeting.

New and Revised Tentative Standards

Ferrous Metals

Specifications for:

Normalized Quenched-and-Tempered Alloy-Steel Forgings (A 63 – 38 T) (revision of standard). *Committee A-1 on Steel.*

Zinc-Coated (Galvanized) Iron or Steel Sheets (A 93 – 38 T) (revision of standard). *Committee A-5 on Corrosion of Iron and Steel.*

Method of:

Test for Uniformity of Coating by the Copper Sulfate Dip Test (Preece Test) on Zinc-Coated (Hot-Galvanized) Steel Castings and Forgings, Gray-Iron and Malleable-Iron Castings (A 208 – 38 T). *Committee A-5.*

Test for Measuring Interlamination Resistance of Steel (A 34 – 38 T). *Committee A-6 on Magnetic Properties.*

Non-Ferrous Metals

Specifications for:

Bare, Stranded Copper Cable: Hard, Medium-Hard or Soft (B 8 – 38 T) (revision of standard). *Committee B-1 on Copper and Copper-Alloy Wires for Electric Conductors.*

Brass Sheet and Strip (B 36 – 38 T) (revision of standard). *Committee B-5 on Copper and Copper Alloys.*

*Rolled Copper-Alloy Bearing and Expansion Plates for Bridge and Other Structural Uses (B 100 – 38 T). *Committee B-5.*

Methods of:

Test for Dielectric Strength of Anodized Aluminum (B 110 – 38 T). *Committee B-7 on Light Metals and Alloys.*

Bend Testing of Wire (B 113 – 38 T). *Committee B-4 on Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys.*

Test for Temperature-Resistance Constants of Sheet Materials for Shunts and Precision Resistors (B 114 – 38 T). *Committee B-4.*

High Temperature Test

Method of:

*Test for Long-Time (Creep) High-Temperature Tension Tests of Metallic Materials (E 22 – 38 T). *Joint Research Committee on Effect of Temperature on the Properties of Metals.*

Cement

Specifications for:

*Masonry Cement (C 91 – 38 T). *Committee C-1 on Cement.*

Methods of:

*Chemical Analysis of Portland Cement (C 114 – 38 T). *Committee C-1.*

Concrete and Concrete Aggregates

Specifications for:

*Concrete Irrigation Pipe (C 118 – 38 T). *Committee C-13 on Concrete Pipe.*

Concrete Masonry Units for Use in Construction of Catch Basins and Manholes (C 139 – 38 T). *Committee C-15 on Manufactured Masonry Units.*

Methods of:

Sampling and Testing Concrete Masonry Units (C 140 – 38 T). *Committee C-15.*

Determination of Yield of Concrete (C 138 – 38 T). *Committee C-9 on Concrete and Concrete Aggregates.*

Test for Sieve Analysis of Fine and Coarse Aggregates (C 136 – 38 T). *Committees C-9 and D-4 on Road and Paving Materials.*

Test for Soundness of Aggregates by Freezing and Thawing (C 137 – 38 T). *Committee C-9.*

Brick and Tile

Specifications for:

Structural Clay Load-Bearing Wall Tile (C 34 – 38 T) (revision of standard). *Committee C-15.*

Sand-Lime Building Brick (C 73 – 38 T) (revision of standard). *Committee C-15.*

Refractories

Methods of:

Test for Size, Warpage, and Bulk Specific Gravity of Refractory Brick (C 134—38 T). *Committee C-8 on Refractories.*

Test for True Specific Gravity of Burned Refractory Materials (C 135 – 38 T). *Committee C-8.*

Pigments and Paint

Specifications for:

Red Lead (D 83 – 38 T) (revision of standard). *Committee D-1 on Paint, Varnish, Lacquer, and Related Products.*

Reduced Para Red (D 264 – 38 T) (revision of standard). *Committee D-1.*

Aluminum Powder for Paints (Aluminum Bronze Powder) (D 266 – 38 T) (revision of standard). *Committee D-1.*

Aluminum Pigment Paste for Paint (D 474 – 38 T). *Committee D-1.*

C.P. Para Red Toner (D 475 – 38 T). *Committee D-1.*

Titanium Dioxide Pigments (D 476 – 38 T) (revision of standards). *Committee D-1.*

Zinc Sulfide Pigments (D 477 – 38 T) (revision of standards). *Committee D-1.*

C.P. Zinc Yellow (Zinc Chromate) (D 478 – 38 T). *Committee D-1.*

Methods of:

Test for Reactivity of Paint Liquids (D 479 – 38 T). *Committee D-1.*

Sampling and Testing Aluminum Powder and Aluminum Paste (D 480 – 38 T). *Committee D-1.*

Naval Stores

Methods of:

Sampling and Grading Rosin (D 509 – 38 T). *Committee D-17 on Naval Stores.*

Petroleum Products and Lubricants

Specifications for:

Stoddard Solvent (D 484 – 38 T). *Committee D-2 on Petroleum Products and Lubricants.*

Methods of:

Test for Acid Heat of Gasoline (D 481 – 38 T). *Committee D-2.*

Test for Ash Content of Petroleum Oils (D 482 – 38 T). *Committee D-2.*

Test for Saponification Number (D 94 – 38 T) (revision of standard). *Committee D-2 and Committee D-9.*

Test for Unsulfonated Residue of Plant Spray Oils (D 483 – 38 T). *Committee D-2.*

*Test for Knock Characteristics of Motor Fuels (D 357 – 38 T). *Committee D-2.*

*Test for Penetration of Lubricating Greases and Petroleum (D 217 – 38 T). *Committee D-2.*

Road Materials

Specifications for:

Crushed Stone for Waterbound Base and Surface Courses (D 489 – 38 T) (revision of standards). *Committee D-4 on Road and Paving Materials.*

Crushed Slag for Waterbound Base and Surface Courses (D 488 – 38 T) (revision of standards). *Committee D-4.*

Crushed Stone for Bituminous Macadam Base and Surface Courses (D 192 – 38 T) (revision of standard). *Committee D-4.*

Crushed Slag for Bituminous Macadam Base and Surface Courses (D 487 – 38 T) (revision of standards). *Committee D-4.*

Crushed Stone for Bituminous Concrete Base and Surface Courses (D 486 – 38 T) (revision of standards). *Committee D-4.*

Crushed Slag for Bituminous Concrete Base and Surface Courses (D 485 – 38 T) (revision of standards). *Committee D-4.*

Tar (D 490 – 38 T) (revision of standards). *Committee D-4.*

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*Indicates tentative specifications issued previous to 1938 but extensively modified this year.

Waterproofing and Roofing Materials

Specifications for:

Asphalt Mastic for Use in Waterproofing (Asphalt Cement, Mineral Filler, Mineral Aggregate) (D 491 – 38 T). *Committee D-8 on Bituminous Waterproofing and Roofing Materials.*

Coal

Method of:

Sampling Coals Classed According to Ash Content (D 492 – 38 T). *Committee D-5 on Coal and Coke.*

Definitions of:

Varieties of Bituminous and Sub-bituminous Coals (D 493 – 38 T). *Sectional Committee on Classification of Coals.*

Electrical Insulating Materials

Methods of:

Test for Acetone Extraction of Phenolic Molded or Laminated Products (D 494 – 38 T). *Committee D-9 on Electrical Insulating Materials.*

Test for Arc Resistance of Solid Electrical Insulating Materials (D 495 – 38 T). *Committee D-9.*

Rubber

Methods of:

Testing Flat Rubber Belting (D 378 – 38 T) (revision of standards). *Committee D-11 on Rubber Products.*

Textile Materials

Specifications for:

Bleached Wide Cotton Sheeting (D 503 – 38 T). *Committee D-13 on Textile Materials.*

Single-Ply Bleached Cotton Broadcloth (D 504 – 38 T). *Committee D-13.*

Terry (Turkish) Toweling (D 505 – 38 T). *Committee D-13.*

Methods of:

Test for Fastness of Colored Textile Fabrics to Light (D 506 – 38 T). *Committee D-13.*

Testing and Tolerances for Spun Rayon Yarns and Threads (D 507 – 38 T). *Committee D-13.*

Testing and Tolerances for Yarns Spun From Wool Mixed with Fibers Other than Wool (D 508 – 38 T). *Committee D-13.*

Definitions of:

*Terms Relating to Textile Materials (D 123 – 38 T). *Committee D-13.*

Soaps and Detergents

Specifications for:

White Floating Toilet Soap (D 499 – 38 T). *Committee D-12 on Soaps and Detergents.*

Chip Soap (D 496 – 38 T). *Committee D-12.*

Powdered Laundry Soap (D 498 – 38 T). *Committee D-12.*

Ordinary Laundry Bar Soap (D 497 – 38 T). *Committee D-12.*

Methods of:

Test for Particle Size of Soaps and Other Detergents (D 502 – 38 T). *Committee D-12.*

Determination of Combined Sodium and Potassium Oxides in Soaps (D 460 – 38 T) (revision of standard). *Committee D-12.*

Chemical Analysis of Special Detergents (D 501 – 38 T). *Committee D-12.*

Chemical Analysis of Sulfonated (Sulfated) Oils (D 500 – 38 T). *Committee D-12.*

Definitions of:

*Terms Relating to Soaps and Detergents (D 459 – 38 T). *Committee D-12.*

Water for Industrial Uses

Methods of:

Sampling Plant or Confined Waters for Industrial Uses (D 510 – 38 T). *Committee D-19 on Water for Industrial Uses.*

Determination of the Calcium Ion and Magnesium Ion in Industrial Waters (D 511 – 38 T). *Committee D-19.*

Determination of the Chloride Ion in Industrial Waters (D 512 – 38 T). *Committee D-19.*

Determination of Total Carbon Dioxide and Calculation of the Carbonate and Bicarbonate Ions in Industrial Waters (D 513 – 38 T). *Committee D-19.*

Determination of the Hydroxide Ion in Industrial Waters (D 514 – 38 T). *Committee D-19.*

Determination of the Total Orthophosphate and Calculation of the Respective Orthophosphate Ions in Industrial Waters (D 515 – 38 T). *Committee D-19.*

Determination of the Sulfate Ion in Industrial Waters (D 516 – 38 T). *Committee D-19.*

Standards and Tentative Standards Withdrawn and Replaced

Actions at the annual meeting based on the various standing committee recommendations as detailed in the preprinted reports resulted in the withdrawal of 36 standards and tentative standards. Of the standards, 17 were specifications and 7 test methods; 11 tentative specifications and one tentative method were withdrawn.

In reviewing the accompanying list, it should be kept definitely in mind that in a great many cases the items withdrawn have been replaced by other specifications or tests accepted at the 1938 meeting (these are listed above under New and Revised Tentative Standards) or in a few cases by items issued previous to this year.

Full details of all of the actions affecting the standards and tentative standards are given in the Summary of Proceedings which is being sent to each member in a separate mailing; later in the year accompanying the 1938 Supplement to the Book of Standards each member and also purchaser of either part of the Book of Standards will receive stickers listing the standards withdrawn so that these can be affixed in the proper place in either Part I or Part II of the Book of Standards.

STANDARD Specifications for:

Sheet High Brass (B 36 – 33).
Yellow Brass Sand Castings for General Purposes (B 65 – 28).
Calcined Gypsum (C 23 – 30).
Building Brick (Made from Clay or Shale) (C 62 – 30).
Sand-Lime Building Brick (C 73 – 37).
Burlap Saturated with Bituminous Substances for Use in Waterproofing (D 174 – 25).
Broken Stone for Waterbound Macadam Surface Course (D 191 – 29).
Broken Slag for Waterbound Base and Wearing Course (D 65 – 23).
Shovel-Run or Crusher-Run Broken Slag for Waterbound Base (D 66 – 23).
Broken Stone for Bituminous Macadam (D 192 – 29).
Broken Slag for Bituminous Macadam Base (D 195 – 27).
Broken Slag for Bituminous Macadam Wearing Course (D 159 – 27).
Broken Stone for Bituminous Concrete Surface (D 194 – 29).
Broken Slag for Bituminous Concrete Base (D 196 – 27).
Broken Slag for Bituminous Concrete (Coarse-Graded Aggregate Type) (D 160 – 27).
Broken Slag for Bituminous Concrete (Fine-Graded Aggregate Type) (D 161 – 27).
Carded 23/5/3 American Tire Cord (D 298 – 29).

STANDARD Methods of:

Test for Sieve Analysis of Aggregates for Concrete (C 41 – 36).
Mechanical Analysis of Sand or Other Fine Highway Material, Except Fine Aggregates Used in Cement Concrete (D 7 – 27).
Mechanical Analysis of Broken Stone or Broken Slag, Except Aggregates Used in Cement Concrete (D 18 – 16).
Mechanical Analysis of Mixtures of Sand or Other Fine Material with Broken Stone or Broken Slag, Except Aggregates Used in Cement Concrete (D 19 – 16).
Test for Determination of Polishing Lubricant in Aluminum Powder for Paints (Aluminum Bronze Powder) (D 306 – 31).
Test for Saponification Number (D 94 – 36).
Testing Rubber Belting Used for Power Transmission (D 378 – 36).

TENTATIVE Specifications for:

Hard-Drawn Copper Transmission Cable (B 87 – 32 T).
Broken Stone for Bituminous Concrete Base (D 193 – 29 T).
Low-Carbon Tar for Surface Treatment, Cold Application (D 105 – 36 T).
High-Carbon Tar for Surface Treatment, Cold Application (D 104 – 36 T).
Low-Carbon Tar for Surface Treatment, Hot Application (D 109 – 36 T).
High-Carbon Tar for Surface Treatment, Hot Application (D 108 – 36 T).
Low-Carbon Tar Cement (D 111 – 36 T).
High-Carbon Tar Cement (D 110 – 36 T).
Low-Carbon Tar Cement for Use Cold in Repair Work (Cut-Back Product) (D 107 – 28 T).
High-Carbon Tar Cement for Use Cold in Repair Work (Cut-Back Product) (D 106 – 28 T).
Broken Stone for Waterbound Base (D 190 – 29 T).

TENTATIVE Methods of:

Test for Saponification Number of Electrical Insulating Oils (Modified Baader Method) (D 438 – 36 T).

Wanted: An International Committee On Nomenclature

By Albert Sauveur

Editor's Note.—Doubtless many Society members will have formed some opinions on the topic discussed by Doctor Sauveur. The Society is concerned with nomenclature in many fields. Is this particular problem one that could be reviewed with advantage by say, Committee E-4 on Metallography, or should the opinions, formed by publicizing the problem, be allowed to simmer and crystalize before A.S.T.M. attempts any interpretation as a body? Comments are invited.

It must be apparent to American students of metallography that a schism has developed in their ranks which, if not promptly healed, will confuse and disconcert new adepts in this important field.

I have more especially in mind the differences of opinion held by certain groups as to the meanings which should be attached to the terms pearlite, sorbite, and troostite.

In 1910 a committee was organized by The International Association for Testing Materials to consider "the nomenclature of the microscopic substances and structures of steel and cast iron." This committee was composed of the following members: H. M. Howe (United States), *chairman;* F. Osmond (France), H. C. H. Carpenter (England), W. Campbell (United States), C. Benedicks (Sweden), F. Wüst (Germany), A. Stansfield (Canada), J. E. Stead (England), L. Guillet (France), E. Heyn (Germany), W. Rosenhain (England), and Albert Sauveur (United States), *secretary.*

In its report presented in 1912 the committee defined pearlite in the following terms: "The iron carbon eutectoid consisting of alternate masses of ferrite and cementite. A conglomerate of about 6 parts of ferrite and 1 of cementite. When pure, contains about 0.90 per cent of carbon, 99.10 per cent of iron."

The definition implied that pearlite was that constituent, approximately eutectoid in composition and clearly lamellar in structure, resulting from the slow cooling of iron carbon alloys through their thermal critical ranges. It was the product of the slow transformation of austenite of eutectoid composition. If austenite was not originally of eutectoid composition, then not until it had reached that composition through the rejection of ferrite or of cementite would pearlite form. All of which was in agreement with our understanding of the teaching of the equilibrium diagram.

This conception of the nature of pearlite was universally accepted and remained unchallenged for a quarter of a century.

In recent years, however, some writers have proposed to describe as pearlite all aggregates of ferrite and cementite, with the exception of martensite, resulting from the cooling of austenite to room temperature quite regardless of the carbon content and microstructure of these aggregates. In other words, they now propose to describe as pearlite those structures or constituents which in the past had been designated as troostite and sorbite. To illustrate: steel containing some 0.40 per cent carbon cooled in air from its austenitic range, so generally considered as sorbitic, is described by them as consisting of pearlite, although that pearlite would contain but one-half the normal amount of carbon present in the eutectoid and be very imperfectly lamellar, and that only in spots. Its ferrite lamellae would have to be some fourteen times thicker than its cementite lamellae.

In an attempt to show that pearlite is not necessarily of eutectoid composition, it is sometimes pointed out that iron carbon alloys containing considerably less carbon or considerably more carbon than the eutectoid, possibly as little as 0.75 per cent or as much as 0.95 per cent, appear under microscopical examination to be wholly pearlitic. This I believe to be due chiefly to the difficulty of detecting the occurrence of small amounts of ferrite or of cementite and does not affect the soundness of the definition proposed.

To have certain authoritative writers refer to some microstructures of steel as consisting of pearlite while other no less authoritative writers describe them as sorbite or troostite should not be tolerated.

We should speak the same language, but it is not for any one of us, nor for any small group, or even for any large group to decide what that language should be. It must be an universal language and not a Yankee dialect, unless indeed the Yankee dialect is adopted as the universal language. There is no room here for arbitrariness, sophistry, or provincialism.

So important a matter can only be decided by an international committee made up of outstanding metallurgists representing the various countries in which metallographic studies are actively pursued.

Testing Work in Indiana Highway Project

Some Notes by W. K. Hatt

Editor's Note.—At our suggestion, Prof. W. K. Hatt, who is directing the work of the Indiana Joint Highway Research Project, has kindly furnished the following notes on certain phases of the work which would seem to be of interest to many A.S.T.M. members.

The legislature of the State of Indiana, through the State Highway Commission, has appropriated $50,000 a year to be spent at Purdue University in prosecution of a project of highway research. With the assistance of an Advisory Board on which are named three members from the Engineering Staff of the Highway Commission and three members from the University, a definite program of research has been drawn up. The research is under the direction of Professor W. K. Hatt. Dr. H. F. Kriege of Toledo, Ohio, is serving as Consultant.

Certain of the projects in this program may be mentioned.

Compression Test of Soils: (R. I. Mayo in charge).

The shearing test of soils is considered fundamental in measurements of stability. As performed at present, difficulties in technique and uncertainties in theory present themselves.

On the other hand, the simple compression test, so widely

used and standardized for many materials, is really a test for shearing strength if failure is attended by development of a cone which indicates shear action on internal planes.

The Joint Highway Research Project is attempting to develop a method of compaction of soil mixtures in a cylindrical mold such that uniform compaction vertically and sidewise may result and typical cones may appear in a specimen tested in compression.

Several methods of compaction have been tried as follows:

1. Compaction in layers by Proctor hammer.
2. Number 1 procedure plus rodding with ½ in. steel rod.
3. Number 1 procedure plus rodding by a ⅛ in. wire.
4. Compaction by steady pressure in testing machine, either from one end of specimen or from both ends.

The latter yields more uniform specimens, and agrees with density values obtained in other tests.

After having been molded, soil mixtures were submitted to a compression test with measurement of elastic limit, modulus of elasticity, and ultimate strength.

Under continuous loading, the material (60 per cent sand, 40 per cent clay) showed an elastic behavior up to 0.6 of the ultimate strength when rodded, and a clearly defined modulus of elasticity. This elastic limit varied with the method of compaction, but has been up to 230 lb. per sq. in., with a modulus of elasticity of 80,000 lb. per sq. in. for rodded compaction with a wire; and 160 lb. per sq. in. elastic limit, 260 lb. per sq. in. ultimate strength rodded with ½ in. rod; and 100 lb. per sq. in. elastic limit, and 287 lb. per sq. in. ultimate strength when compressed in the testing machine. This investigation will be continued and an attempt will be made to correlate compressive strength with routine tests and with service in the field.

Frost Heaving of Road: (H. F. Winn in charge)

The program of research includes a study of heaving of roads as related to frost action. It is well known that freezing action proceeds downward from a road surface and will meet, in capillary soils, water coming up from below, with the result that ice-lenses are formed within the road bed. With such an open system, the ice-lenses increase in size with the continued supply of capillary water from below. The road surface then heaves. The laboratory has developed a room with controlled temperature and with provisions for duplicating these actions of nature. Soil mixtures with several stabilizing admixtures are tested to determine what admixture and what amount increase of height of the specimens may be prevented. The existence of such ice-lenses is visible. These laboratory results are compared with the behavior of a test road containing the same stabilizing admixtures. The test road, subjected only to changes of climate has been under observation since November, 1937. It also serves to indicate the predictive value of routine tests of soils, such as freezing and thawing, wetting and drying, etc.

Relation between Action of Roller and Standard Abrasion Tests: (T. E. Shelburne in charge)

In treatment of old surfaces with mixtures of bitumen and rather fine aggregate, the material is rolled with a 10-ton or a 5-ton roller, resulting in a degradation of the aggregate.

Whether one of the standard abrasion tests, for instance the so-called Los Angeles rattler test, will select the aggregate most suitable for such service, is a matter of doubt in the minds of several experts.

To develop this information, a section of a rigid road (concrete), and also a section of a semi-rigid road (oil mat), has been built. All the aggregates commonly used in Indiana will be in turn spread on these roads and subjected to the action of rollers. Sieving before and after will determine the loss of aggregate. Identical samples will be subjected to the Los Angeles rattler test.

Observations already made on such surface treated roads that have been in service for a year, show a disintegration shortly after rolling, and a continual disintegration with duration of service under traffic.

Study of Bitumens: (O. R. Tyler in charge)

A Bulletin is in press reporting a research upon the adhesion of several bitumens to typical aggregates. The laboratory is now engaged in a study of Kentucky rock asphalt from production at the plants to use in road construction.

Report of Committee C-12 on Mortar[1]

COMMITTEE C-12 on Mortars for Unit Masonry has held two meetings during the past year, in Washington, D. C., on November 4, 1937 (the reorganization meeting), and in Pittsburgh, Pa., on March 18, 1938. Though no standards are offered at this time for acceptance by the Society, the committee has been quite active.

At the reorganization meeting in November there was a general discussion of the type and nature of test methods around which specifications were to be developed. A Subcommittee on Methods of Test (A. T. Goldbeck, chairman) was appointed and instructed to report on the present status of tests for mortars. This report was submitted to the committee at the March meeting in the form of a compilation of test methods used or proposed for use on mortar. This report has now been revised and is accompanied by a summary of the comments and criticisms received at the March meeting and thereafter by correspondence. It is hoped that arrangements can be made for the publication of this report as information.

Committee C-12 is establishing two new standing subcommittees, one on specifications for mortar and the other on sand for mortar. For the present the committee's plan is to have three permanent subcommittees in general charge of methods of test and specifications. Special technical problems will be assigned to "working" or "special" subcommittees. The problems of measuring the workability of mortar and the problem of predicting volume change in mortar illustrate the type of questions referred to special subcommittees.

The personnel of Committee C-12 has been the subject of much consideration. The present attitude of the committee is that (1) the committee should be kept small for the present, (2) that the various types of materials should be adequately represented and with substantial balance, and (3) that membership should be restricted as far as possible to representatives with a technical viewpoint.

Respectfully submitted on behalf of the committee,

H. C. PLUMMER, *Secretary*

J. W. MCBURNEY, *Chairman*

[1] Presented at the Forty-first Annual Meeting, Am. Soc. Testing Mats., Atlantic City, N. J., June 27-July 1, 1938.

Report of the Joint Research Committee On Boiler Feedwater Studies[1]

THE Joint Research Committee on Boiler Feedwater Studies reports activities under the auspices of several of its subcommittees.

Subcommittee 6, engaged in research study on the cause and prevention of caustic embrittlement, has concluded from its laboratory work that lignins successfully prevent the development of intercrystalline cracking in steel specimens stressed under a static load or in a reversing torsional load. No confirming experience in stationary boilers is available at the present time; however, in the case of railroad locomotives, lignins and lignin-containing materials have shown evidence of successful performance in this regard. Theoretical explanations of the cause of caustic embrittlement and its prevention by means of lignins have been offered in several recent reports prepared by the investigators. Progress Report 13, given as a paper under the title "Intercrystalline Cracking in Boiler Steel"[2] at the 1938 annual meeting of the American Water Works Association presents in condensed manner the status of this important project. There is little indication that any inorganic salt commonly encountered in boiler water exerts a major influence in the prevention of embrittlement. The work of this subcommittee is planned to be extended to cover the following aspects of the general problem:

1. A more comprehensive study of the effects of chlorides on embrittlement. This is designed to confirm the recent results of the work at the University of Illinois.
2. Further work on the use of lignin as a preventive measure particularly as to the practicability of its use in boilers.
3. Further study of the concentration of the boiler water salines in the capillary spaces of the boilers.
4. Study of the tendency of actual boiler water to cause embrittlement.
5. A study of the occurrence or possibilities of the occurrence of caustic embrittlement in boilers operating above 500-lb. pressure.

The final report on the research directed toward the development of a more exact method for determining traces of dissolved oxygen has been completed and referred to A.S.T.M. Committee D-19 on Water for Industrial Uses for consideration in its program of issuing standard methods for the analysis of water.

The work of Subcommittee 1 on Coagulation and Sedimentation is still in the formative stage. The chairman submitted a proposed program which involved the preparation of a paper designed to stimulate round-table discussion on this subject at one of the sessions sponsored by the committee. It is hoped that this paper will stimulate much discussion and provide constructive advice regarding the desirable course of a research study of this subject.

No active research program is contemplated on the general subject of corrosion, it being felt that there is no specific problem aside from the two now being given active attention that would command a widespread interest and justify general financial support. The two problems referred to are: (1) that of intercrystalline cracking being conducted under the auspices of Subcommittee 6, and (2) the study of the reaction between steel and steam at high temperatures which is being carried out principally under the direction of Dean A. A. Potter at Purdue University. It is the intention of the officers of the committee to secure for presentation at meetings under its auspices reports of specific cases of corrosion that are of unusual interest.

The Subcommittee on Patents in the field of boiler feedwater treatment has continued to function, and in 1937 prepared an excellent report, copies of which were distributed to the secretaries of all sponsor societies.

The organization and program of a Technical Subcommittee on Municipal Water Supplies in relation to the industrial use of that water is being given active consideration.

Respectfully submitted on behalf of the Joint Research Committee,

C. H. FELLOWS,
Chairman

R. C. BARDWELL,
Vice-Chairman

J. B. ROMER,
Secretary

[1] Presented at the Firty-first Annual Meeting, Am. Soc. Testing Mats., Atlantic City, N. J., June 27-July 1, 1938.

[2] W. C. Schroeder, A. A. Berk and C. H. Fellows, *Journal*, Am. Water Works Assn., Vol. 30, No. 4, p. 679 (1938).

Status of Coal Classification in Canada

IN 1928 there was organized under the auspices of the National Research Council of Canada and the Dominion Department of Mines an Associate Committee on Coal Classification and Analysis, the object of which was to cooperate with the A.S.T.M. Sectional Committee on the Classification of Coal and to study the question of coal classification in relation to Canadian coals. It was realized from the first that a common system of classification was desirable, if found feasible.

Considerable research work bearing on the classification of coal was carried out in the Fuel Research Laboratories of the Dominion Department of Mines and the laboratories of the University of Alberta and the results were placed before both the sectional and associate committees. Through Canadian representation on the sectional committee and its subcommittees both main committees were kept aware of all progress made and, in fact, the work proceeded substantially as a joint project.

When the sectional committee accepted tentative standards for classification by rank and grade, respectively D 388 and D 389, a report embodying these specifications was prepared by Prof. Edgar Stansfield of the University of Alberta and circulated through the committee to the managers of all Canadian collieries having a yearly production of over 5000 tons, to mine inspectors and to the members of the associate committee. No objection was raised to the adoption of the standards *in toto* and these have now been officially accepted by the associate committee. An explanatory bulletin is at present in preparation for distribution to the principal Canadian users of coal and to trade journals. This will show the application of the new systems of classification to Canadian coals and will, it is hoped, promote their general adoption in Canada.

Standardization Activities Under Way

Numerous Specifications and Tests Being Developed

In the material which follows there is given condensed information on a number of important standardization activities including several items which are nearing completion and which are expected to be submitted to Committee E-10 on Standards late in August for approval and also a number of other items where active progress is being made. In many cases this information supplements reviews of committee work which are given in the annual reports of the committees.

METALS AND METAL PRODUCTS

Committee A-1 on Steel has completed four proposed tentative specifications which are to be submitted to the Society through Committee E-10 following a letter ballot vote. The materials covered include medium carbon seamless steel boiler and superheater tubes, and carbon-molybdenum alloy-steel boiler tubes, spiral welded steel or iron pipe, and lap-welded and seamless steel and lap-welded iron boiler tubes, the latter an extensive revision of an existing standard which it is intended to replace. A number of changes will involve the existing requirements for seamless boiler tubes for high-pressure service (A 192) and specifications for electric-fusion-welded pipe for sizes 8 in. and over (A 134 and A 139) providing eventually for the inclusion of spiral pipe requirements.

Consideration is being given to a broad specification covering two or more grades of high tensile structural steels with different types of compositions and also requirements for high-strength steels for locomotives, cars, etc. This problem is a difficult one because time and the proper amount of testing and use are needed to sift the present galaxy of these steels into general acceptability to warrant standardized requirements. Weldability is another important problem involved.

Agreement has been reached in a subcommittee of Committee A-5 on Corrosion of Iron and Steel for methods covering thickness of electrodeposited coatings, but work on methods of sampling these coatings is being continued. Committee A-10 on Iron-Chromium-Nickel and Related Alloys has developed a recommended procedure for making field corrosion tests in chemical engineering environments; this is to be studied further. Also proposed specifications for seamless chromium-nickel austenitic alloy steel still tubes for refinery service have been drafted.

Committee B-2 on Non-Ferrous Metals and Alloys has completed two specifications, one covering electrolytic cathode copper in which metal content and resistivity are specified (metal content copper to have a minimum purity of 99.90 per cent, silver being counted as copper, and resistivity not to exceed 0.15436 international ohms per metergram at 20 C.). Specifications for nickel-copper alloy plates, sheets and strips, apply to all purposes for which this material is applicable. The specifications are general. Provision is made therein for material suitable for drawing, forming, stamping, bending, spinning, joining, and all other common methods of fabrication. It is expected these will be submitted to Committee E-10 on Standards for approval for publication. The Committee on Corrosion of Non-ferrous Metal and Alloys is continuing its work of writing a satisfactory recommended practice for the salt-spray test.

A proposed high-temperature accelerated life test for electric furnace resistance alloys is being given further trial by cooperating members of Committee B-4 on Electrical-Heating, Resistance and Furnace Alloys. The warpage test is being developed covering wrought and cast alloys for high-temperature use and the work involving materials for radio tubes and incandescent lamps has continued with proposed methods developed covering testing of nickel and nickel-alloy electronic tube filaments and cathode sleeves and cathode tubing. A method for testing brittleness of tungsten wire is being completed.

The group working on cast metals and alloys under Committee B-5 on Copper and Copper Alloys has an extensive program confronting it. The inclusion of physical properties in all specifications to cover basic requirements rather than chemical composition is one item. Specifications are to be prepared covering a new group of alloys classified as "red brass." Under this classification brass alloys would include tin 5 per cent plus; lead and zinc 5 per cent minus; and red brass alloys, tin 5 per cent and under.

CEMENTITIOUS, CERAMIC, CONCRETE AND MASONRY MATERIALS

The program of Committee C-7 on Lime includes further work on definitions, study of a tentative specifications for hydraulic hydrate of lime, and continued cooperative work with the Technical Association of the Pulp and Paper Industry involving specifications on lime for recausticizing, the use of residual precipitated carbonates as paper fillers in high-grade paper, also continued investigation of the method of determining available lime by the rapid sugar test.

Among the several projects being carried forward by the committee on refractories are revisions of methods of chemical analysis covering procedures for chrome ores and chrome brick and the development of test methods for insulating block and refractories. Cooperative work is being continued with the National Bureau of Standards on the method of determining thermal conductivity of refractory materials at high temperatures.

In the field of concrete and concrete aggregates Committee C-9 expects to submit to the Society through Committee E-10 procedure a proposed method of test for clay lumps in aggregate and revisions of the test for abrasion of coarse aggregate by use of the Los Angeles machine (jointly with Committee D-4) and revision of the test for unit weight of aggregate for concrete. These items were published in the annual report of the committee.

Included in the projects of Committee C-1 on Cement is a series of cooperative chemical tests for determining free lime and consideration is being given to the preparation of quick methods for silica, lime, and magnesia and also direct methods for obtaining alumina and titanium oxide.

One of the interesting projects of Committee C-15 on Manufactured Masonry Units is the development of a list of sizes of building units which conform to a single module, to make possible the assembly of the various structural members of a building without extensive cutting and waste.

The Committee on Natural Building Stones plans to recommend to the Society for approval to Committee E-10, the procedure for uniform cubing of stone. The committee plans to carry out further test work in developing information on the size and form of test specimens referred to in the compression test procedure. A form of abrasion test procedure for determining wear resistance of natural stone and slate used for walk-way surfaces has been developed.

PAINTS, ROAD MATERIALS, COAL AND COKE, NAVAL STORES, PAPER, ETC.

Among the several activities of Committee D-1 on Paints, Varnishes, etc., is a study of the possibility of standardizing methods for determining the consistency of enamel-type paints, taking under consideration the Stormer viscometer, Gardner-Parkes mobilometer, and the A.S.T.M. consistency cup specified for nitrocellulose lacquers, together with the Ford cup. Definitions and methods of test for determining gloss of paints have been developed and will be subjected to practical test during the coming few months.

The Committee on Naval Stores will continue its work on crystallization of rosin to develop a practical method of determining this tendency. Work on methods of determination of petroleum ether insoluble matter and the determination of ash in rosin will be started.

Several years' work in developing information which would serve as a reliable basis for recommending specifications for asphalt plank resulted in proposed requirements which are published for information in the report of Committee D-4 on Road and Paving Materials. They cover two types of plank used for bridge floors, namely, plain and mineral-surfaced plank. The requirements are given for mineral surfacing, asphalt cement, fiber and mineral filler used, and provide for certain sampling and testing methods covering absorption test, brittleness, and indentation tests. The committee plans to submit this specification to the Society during the summer for approval.

The Committee on Coal and Coke is considering specification requirements for foundry coke and also sampling coke for size testing, since this latter question is one of the most important considerations of coke for foundry use. Arrangements are being made to distribute samples of coal of various ranges to different laboratories for making expansion tests by various methods. This preliminary work is necessary in the selection or development of a standardized procedure for determining expanding properties.

Committee D-6 on Paper and Paper Products is making progress in its extensive program and substantial agreement has been reached on a number of proposed methods of testing. The list of methods which are being considered by the committee involves: Sampling, fiber composition, conditioning, bursting strength, tensile strength, paraffin, sulfur, thickness, moisture, ash, tearing strength, casein, opacity, bulk, saturating properties and water resistance. Procedures which have been issued by the Technical Association of the Pulp and Paper Industry are forming the basis of consideration. The work on fiberboard and fiberboard containers will involve an extensive research program to secure data on the moisture content of container grades of paperboard and of corrugated fiberboard containers resulting from conditioning these products under several different procedures and to determine the practicability of the methods of conditioning in relation to duplication of test results.

ELECTRICAL INSULATION, RUBBER, SOAPS, TEXTILES

Committee D-9 on Electrical Insulating Materials is preparing standardized requirements for laminated phenolic tubes for radio use. Information is being assembled in developing a test for acid and alkali resistance of varnishes and its work on mica production will be continued including a study of various purchase specifications.

Committee D-11 on Rubber Products is working on a program of standardization in the field of valves and packings with attention devoted to performance tests intended to evaluate the materials. The committee has been investigating colorimetric methods for the determination of small amounts of manganese and copper in rubber, and expects shortly to have a report on the results of a cooperative test program. Since many consumers and producers of rubber goods are concerned with tests for evaluating aging and cracking of rubber exposed to light, a survey of existing methods is being made and work will be undertaken to formulate standard procedures.

Specifications for soap powders, liquid soaps, and rough cleaning compounds, will be considered further by Committee D-12 on Soaps and Other Detergents. Methods and specifications for dry cleaning detergents and also textile detergents will be discussed and specifications drafted. Tests for determining carbon dioxide in soaps are being prepared and the committee is considering the McNicol method for rosin and other methods for water insoluble matter.

Numerous standardization projects are detailed in the report of Committee D-13 on Textile Materials. Procedures for determining twist and sample size in the methods of testing cotton yarns and threads are being considered, also specifications for ladder tapes for venetian blinds and a section is working on methods of testing and tolerances for rayon staple. Research work is under way which it is hoped will lead to methods for the identification of mohair fiber. In the work on pile floor covering, wear test methods and their correlation with actual service tests, chemical tests for spotting, crocking and bleeding, and a method of measurement for tuft length are being developed. The sub-group on household and garment fabrics is extending its work on broadcloths to include plied fabrics and is undertaking cooperative projects on upholstery materials, mercerization, and water absorption of toweling.

Committee E-1 on Methods of Testing has a number of items under way including a further study of proposed changes in the test method for softening point by tapered ring apparatus. E-1's technical committee on laboratory glassware (formerly, Committee D-15) is developing individual specifications covering each thermometer now specified in existing A.S.T.M. standards.

Numerous Publications to Be Issued

List Includes Several Special Items

In addition to the so-called regular publications including the *Proceedings*, 1938 Supplement to the Book of A.S.T.M. Standards, Year Book, Index to Standards, etc., there are a number of special books which are to be published within the next few months, these having been authorized by the Committee on Papers and Publications for publication during the year.

Brief notes on some of these publications are given below for the information of the members and a list of all of the publications with the special prices to members and other descriptive information will be sent in the form of an order blank to each member in September.

The special compilations of standards issued during the past few years have become of increasing significance and, as indicated below, new editions of these widely used books are to be published.

REGULAR PUBLICATIONS

1938 Proceedings.—Will include, as usual, the technical papers, committee reports, new and revised tentative standards and tentative revisions of standards presented at the 1938 annual meeting. The inclusion of the extensive discussion of the various items adds to the value of the data given. The *Proceedings* will be sent to each member late in the year.

1938 Supplement to Book of A.S.T.M. Standards.—In view of the large number of actions taken at the annual meeting on the adoption of standards and revisions of existing standards, the 1938 Supplement to the Book of A.S.T.M. Standards will be one of the largest yet issued. Work is now under way on this publication and it is expected that copies will be ready for distribution to the members in September.

1938 Book of Tentative Standards.—A compilation of *all* of the tentative standards of the Society, about 350, in their latest form. Although the current *Proceedings* will give the new tentative standards and revisions approved this year, the convenience of having in one place *all* of the A.S.T.M. tentative specifications and methods makes this book in wide demand. Ready about November 1.

Index to Standards and Tentative Standards.—This Index, which becomes of greater value as the number of specifications increases, will again give the latest complete references to publications where the various specifications and test methods appear. This is furnished to members and is also widely distributed on request. Members can obtain additional copies without charge.

Year Book.—Includes a list of the complete membership of the Society (name, address, company, etc.), the personnel of all A.S.T.M. committees, and other pertinent information. Furnished to members on request.

Symposium on Plastics.—The volume containing the papers and discussion presented in connection with the Symposium on Plastics at the Rochester Regional Meeting of the Society in March has already become available, as mentioned in the Circular Letter to members early in May.

SPECIAL PUBLICATIONS

Symposium on Protecting Metals Against Corrosion.—It is planned to issue as a special publication the four papers comprising the Symposium on Protecting Metals Against Corrosion, held in conjunction with a meeting sponsored by the Detroit District Committee on April 19. The symposium should be available within the next few weeks.

1938 Marburg Lecture.—The Marburg Lecture on "The Torsion Test," delivered by Dr. Albert Sauveur at the annual meeting, will be included in the 1938 *Proceedings*, and prior to the publication of the *Proceedings* reprints of the lecture will be issued.

Creep Data Volume.—This publication is being sponsored jointly by the A.S.T.M. and The American Society of Mechanical Engineers, through the Joint Committee on Effect of Temperature on the Properties of Metals. It represents the assembly and interpretation of creep data, involving over 300 tests in the United States and other countries carried out by a special committee of experts in the field. The volume will contain some 420 charts of test data, 270 graphs and 73 tables; it should be available about September 30.

Index to the Literature on Spectrochemical Analysis.—This bibliography, prepared by W. F. Meggers and B. F. Scribner of the National Bureau of Standards, is being issued under the sponsorship of the Society's Committee E-2 on Spectrographic Analysis. It will contain a brief introduction, 930 literature citations and a detailed index. It covers all important contributions to the literature on spectrochemical analysis since the first development of methods of sufficient accuracy and reliability to serve as a basis for the commercial inspection of materials. The Index is scheduled for publication about October 1.

Special Compilations of Standards.—A number of the standing committees, under whose auspices have been issued special compilations of standards covering specific industrial fields, have recommended that new editions of these compilations be made available during the year. All of the A.S.T.M. standard and tentative specifications and tests in the following fields will be included in the respective volumes: petroleum products, electrical insulating materials, rubber products, textile materials, and coal and coke.

Conference on Statistics

A two-day conference is to be held at Massachusetts Institute of Technology dealing with engineering and industrial statistics. At the five sessions on Thursday and Friday, September 8 and 9, there will be addresses and discussion by visiting industrial statisticians and staff statisticians from M.I.T., including a résumé of technique needed for effective handling of data, successful applications in the fields of engineering and quality control and contemporary developments in statistics. It is the purpose of the conference to explain to engineers and executives the nature and possibilities of statistical methods in both engineering and industrial work. Further information may be obtained by addressing the Secretary of the Conference at M.I.T.

Forty-first Annual Meeting

(Continued from page 8)

There was much interest in the paper by S. H. Weaver, General Electric Co., on "Actual Grain Size Related to Creep Strength of Steels at Elevated Temperatures." Based on a statistical analysis of 32 creep tests made on S.A.E. No. 4330 steel at a temperature of 840 F., it was concluded that there is an optimum grain size for the maximum creep stress and that a larger or smaller grain than this gives decreasing stress for the particular steel and temperature. It was reported that grain size may change the creep strength by 21,000 lb. per sq. in. and that the structure within the grain can change the creep strength by 4500 lb. per sq. in. In discussion, a number commented on the present confused situation with regard to grain size terminology, since it is not clear, in referring to size, whether austenitic size, carbide grain size, actual size, or some other value is intended. One discusser indicated that while creep stress of a given steel is associated with its grain sizes, mode of distribution of carbides and stability of this distribution during the tests are factors to be considered and other factors may play a rôle.

Prof. J. B. Kommers, University of Wisconsin, discussed "The Effect of Overstressing and Understressing in Fatigue," giving data obtained after the application of various cycles at 10, 20, and 30 per cent over-stress. He concluded that the endurance limit of a material is not a fixed quantity since various methods affect it. Periods of cyclic overstress quite commonly reduce the endurance limit while periods of progressively increasing cyclic understress may greatly increase the endurance limit.

An abstract of an extensive paper outlining "Recent Developments in European Research of Fatigue of Metals" was given by R. P. Seelig. This paper, to be published serially in the BULLETIN, presents data on testing methods, results, and theories developed in European laboratories. More and more, fatigue experiments in Europe are carried out with shaped parts rather than with standard specimens. The paper discusses in detail fatigue as related to welded joints, the effects of corrosion fatigue, and the very important influence of surface condition of parts under repeated stress.

NON-FERROUS METALS

Committee B-1 on Copper and Copper-Alloy Wires submitted a number of revisions in standards, including extensive changes in requirements for bare stranded copper cable, B 8 – 36, in the form of a new tentative specification. This is sufficiently inclusive to warrant the withdrawal of the Tentative Specifications for Hard-Drawn Copper Transmission Cable (B 87 – 32 T). The committee decided, however, to continue the existing standard B 8 – 36. To make available to the industry at the earliest possible time information on proper limitations and speed of testing for acceptance tests, notes are being added to a number of the specifications.

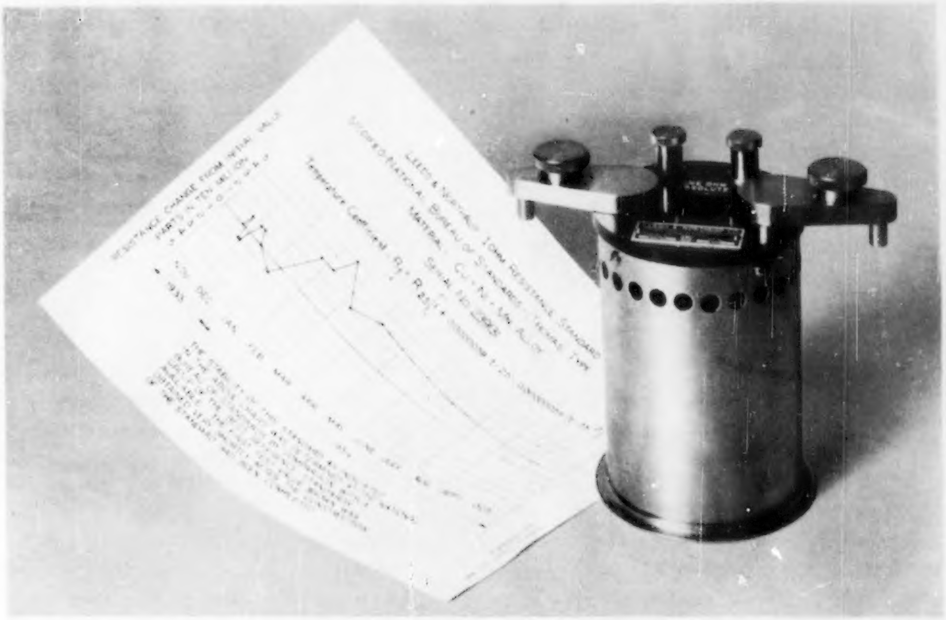
Of major importance in the work of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys was the report of the subcommittee on atmospheric corrosion. This gave the results of the third series of tests on 24 metals and alloys exposed since 1931 to various atmospheres at nine test locations. While the committee indicated that even a qualitative estimation of the corrodibility of the various materials in the various atmospheres based on only the weight change data is of doubtful value at this time, losses where they have occurred are greatest in the industrial type of atmosphere and most marked in the case of nickel and zinc, whose corrosion products are not particularly protective in this type of atmosphere. The committee indicated that in view of small losses of tensile properties experienced by many of the metals and alloys, it is still too early to attempt rating them on the basis of their corrosion resistance or to predict their probable life in any atmosphere. Certain materials have experienced substantial losses in strength and elongation of both at most of the industrial and seacoast locations. For most of the copper and copper alloys, nickel and high nickel-copper alloys, also lead and lead-antimony alloys, tensile strength losses at all test locations are very small. In rural locations the losses of tensile properties for all materials except tin are negligible.

Committee B-5 on Copper and Copper Alloys, Cast and Wrought, recommended the adoption as standard of existing tentative specifications covering bronze castings for locomotive wearing parts and requirements for lined car and tender journal bearings. A number of revisions in tentative standards were approved and modifications were made in the recommendations covering copper and copper alloy seamless condenser tubes, B 111. A recommendation to delete the Tentative Specifications for Sand Castings of the Alloy: Copper 80 per cent; Tin 10 per cent; Lead 10 per cent (B 74 – 32 T) was withdrawn and the specifications will be continued.

Messrs. Catlin and Mudge of the International Nickel Co. presented new data on mechanical properties of nickel and some of its high-strength corrosion-resistance alloys including Monel, Inconel and stainless steels. The authors concluded that tension and torsion impact tests have an advantage over the Izod and Charpy tests, when used on metals of high toughness, because they permit suddenly applied stress to be restricted to a definite area rather than extending over a large region of the specimen, thereby giving more comparable values.

Committee B-7 on Light Metals and Alloys submitted a new method of test for dielectric strength of anodized aluminum. It is indicated that the dielectric strength of an oxide coating can be employed as an approximate measure of its thickness, provided the relation between thickness and dielectric strength has been determined for the specific type of coating under consideration. The committee had developed proposed requirements for aluminum-base alloys in ingot form for die castings, but these were withdrawn and will be considered further. Certain revisions in the standard covering aluminum ingots for remelting had been proposed in the report as preprinted but were withdrawn by the committee. Seven of the tentative specifications covering various types of magnesium-base alloy and aluminum-base alloy materials were revised, in some cases by the addition of new alloys which offer desirable characteristics for certain services. Some alloys were withdrawn because of lack of use or for other reasons.

The committee on die-cast metals and alloys offered revisions in certain tentative specifications, but proposed modi-



"One Ohm Absolute"

Photograph by J. P. Eldredge, Leeds & Northrup Co., awarded First Prize in photographic exhibit.

fications in three of them involving appended information on the speed of testing were deleted for further study.

Committee B-4 on Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys developed two new test methods, one covering temperature-resistance constants of sheet materials for shunts and precision resistors and a method for bend testing of wire for radio tubes and incandescent lamps. There has been considerable interest in connection with the latter item. As a result of discussions subsequent to the printing of the report, there were recommended several important changes in the method. This test evaluates the temper of wire for radio tubes, incandescent lamps and electrical resistance purposes. In general, the test involves clamping a specimen of wire, subjecting it to a bending force and determining the angle of bend. In its report there was published for information a proposed method of testing nickel and nickel alloy electronic tube filaments, but the committee withdrew the proposed method for further study.

SPECTROGRAPHY, METALLOGRAPHY, THERMOMETERS

The Committee on Spectrographic Analysis announced it would recommend the publication by the Society of an extensive index to the literature on spectrochemical analysis compiled by Messrs. Meggers and Scribner of the National Bureau of Standards. This includes a brief introduction, over 900 literature citations and a detailed index covering all important contributions to the literature of spectrochemical analysis since the first development of accurate and reliable methods serving as a basis for commercial inspection of materials.

C. J. Newhaus, International Nickel Co., described "An Arc Source for Quantitative Spectral Analysis." Commenting on the paper, H. V. Churchill, Aluminum Company of America, said that despite certain known disadvantages of the arc in quantitative procedures, there were certain fields where it was advantageous. He felt that the paper was of particular interest because it shows some of the advantages of spectrographic analysis, being simpler than equally precise chemical procedures and far less time consuming. While chemical methods are applicable over wider ranges of composition, the method described by Neuhaus clearly revealed how the spectrograph can be applied to routine testing in a limited range of composition.

Appended to the Report of Committee E-4 on Metallography was a paper by L. L. Wyman, General Electric Co., dealing with plastics for mounting metallographic samples. After covering the general requirements, available materials, chemical properties and discussing other problems including the form of resins and molding practice, he indicated that in general modern plastic materials are quite suitable for mounting, but that there are some disadvantages which are often overlooked in the desire to obtain an apparently more favorable property.

Messrs. Foster and Wilson, Bausch & Lomb Optical Co., described the examination of metals in polarized light, including a description of the way existing microscopes can be corrected to make observations in polarized light. A new polarizing vertical illuminator was covered in detail. Applications of polarized light to the identification of copper oxide, copper sulfide, chromic oxide, and glassy silicates were illustrated, and also, the use of this technique in studies of grain size, preferred orientation and identification of phases in aluminum alloys. Other applications such as the measurement of anodic coating thickness on aluminum alloys were described. It is pointed out that only by systematic investigation can the full utility of the polarizing microscope be realized in any specific field of investigation.

As part of the Report of Committee E-1 on Methods of Testing there was included a paper covering methods of testing thermometers. Changes in thermometers with time and use, standard thermometers for use in testing, the testing equipment necessary including various types of baths and metal block comparators, checking dimensions, test for permanency of range, and choice of test points, all were covered quite completely. The paper was prepared by E. F. Mueller, National Bureau of Standards, and R. M. Wilhelm, C. J. Tagliabue Mfg. Co.

CEMENT, CONCRETE AND CONCRETE AGGREGATES

Two complete sessions were devoted to cement, concrete, and concrete aggregates. A most interesting report was presented by Committee C-9 in which there were included three new tentative standards, one for determination of the yield of concrete, another covering a test for soundness of aggregates, by freezing and thawing, and a third covering sieve analysis of fine and coarse aggregates. The method for yield covers the determination of the volume of freshly mixed concrete produced from a mixture of known quantities of ingredients from which may be calculated the yield, that is, the volume of concrete per unit volume of cement. The freezing and thawing test should furnish information helpful in judging the soundness of aggregates subjected to weathering action.

In addition to recommendations printed in the report, the committee took action to recommend the adoption as standard of revisions published as tentative last year involving the methods of curing concrete with calcium chloride admixture (C 82) and by surface application (C 83).

Appended to the C-9 report were two technical papers dealing with "Stress-Strain Characteristics of Mortars and Concretes" by H. J. Gilkey and Glen Murphy, Iowa State College; and "Factors Affecting the Testing of Concrete Aggregate Durability" by C. E. Wuerpel, U. S. Military Academy. The authors of the first named paper indicated that variations in the water-cement ratio, curing, and age introduce little if any difference in the fundamental stress-strain behavior, but they indicated that variations in amount of aggregate do produce consistent differences in stress-strain behavior; and the differences due to the aggregate carry through consistently from neat cement to lean concrete, the converted diagram being virtually a straight line for the neat cement and becoming more curved and convex to the left as the amount of aggregate is increased.

In his paper Mr. Wuerpel pointed out that from an extensive series of tests the magnesium-sulfate accelerated soundness test of either fine or coarse aggregate bears no constant relation to the freezing-and-thawing test. In spite of the lack of this relationship, the magnesium-sulfate test is a desirable one, if properly conducted. This conclusion arises from the indisputable economy of the test as compared to freezing and thawing and, in the case of fine aggregate, a pronounced acceleration of results. He further indicated that, in the final analysis, all of the tests are relative and bear no fixed relation to the natural attack upon a concrete mass.

Messrs. Jensen and Richart, who continued their work on creep of concrete at the University of Illinois, reported that creep in tests of concrete in compression in relatively short periods of time, varying from 1 to 30 min., was roughly proportional to load for stress below one-half the concrete strength; beyond this point the creep increased at an accelerating rate. Comparisons of the results with published data of long-time tests indicate a continuity between the two and support the view that long- and short-time creeps are fundamentally the same in nature, though the former may be modified by moisture changes and similar conditions which do not exist in the short-time observations.

The paper by Professor Carlson of Massachusetts Institute of Technology involving "Drying Shrinkage of Concrete as Affected by Many Factors" is to be considered a progress report in a long-range program of research aimed toward a better understanding of concrete shrinkage. It is shown that for a common glacial gravel and a standard cement, neither cement content, nor gradation of aggregate, nor duration of preliminary moist curing has much effect on shrinkage. It is indicated that invisible cracking of mortar between aggregate particles is common in concrete subjected to drying. Differences in extent of cracking often may be the distinguishing feature between concretes of high and low shrinkage. Type of aggregate is shown to have a considerable effect on concrete shrinkage.

The paper by C. A. G. Weymouth, Raymond G. Osborne Laboratories entitled "A Study of Fine Aggregate in Freshly Mixed Mortars and Concretes" evoked considerable discussion and interest. The author has developed a procedure for the examination of mortar mixtures which permits studying in detail the effect of the grading of aggregate and which affords some information on the "grading" of the cement. It uses as a basis the mortar-voids relationship developed by Talbot and Richart. It divides voids into three classifications: those originating in the cement paste, those caused by "boundary effect" due to the surface area of the aggregates, and those due to "particle interference" in the grading of the aggregate. The purpose of the paper was to show the application of that procedure to studies of fine aggregate in freshly mixed mortars and concrete. The author concluded that the study of the structure of voids in fresh mixtures of cement, sand, and coarse aggregates is important because of the relation of this structure to the water and air contained in the voids; that every change in the grading consistency, and amount and character of materials causes a corresponding change in the voids in the mortars; and all voids in mortars can be traced to the void pockets enclosed by the finest flour particles of cement and to the boundary pockets of these particles at the surfaces of all larger particles.

Committee C-1 on Cement offered a number of changes in its standards, one involving the tentative specifications and tests for masonry cement in which there were two outstanding revisions, first, a marked increase in the strength requirements, and, second, a requirement covering the change in workability of mortars produced by the removal of some of the mixing water. By deleting the requirement covering fineness of cement from the standard specifications for high-early-strength portland cement, the A.S.T.M. standards for cements of the portland type are brought into conformity with one another as far as fineness is concerned. This action was taken in line with the widely accepted thought that the fineness of a cement is a detail of manufacture of much importance to the producer and, although it is reflected in the physical properties of a cement, it is adequately covered so far as the use is concerned by other physical requirements.

An important change, for immediate adoption, in the standard for portland cement (C 9 – 37) will eliminate the definition and permit the use of admixtures if found not harmful, the same as in the high-early-strength specification (C 74).

There were several extensive reports appended to that of the main committee, one covering investigation of pebble mortars by fourteen laboratories, and one on cooperative

autoclave tests of portland cement. There was considerable discussion at the meeting of the committee on the autoclave test. A proposed procedure for autoclave expansion of portland cement was published for information in the report of the committee but the committee is not recommending it for approval by the Society or incorporation of autoclave requirements in the cement specifications.

A new quick method for determining manganese oxide in cement and new methods for determining potassium oxide and sodium oxide were accepted as tentative for inclusion in the methods of chemical analysis of portland cement. A very active subcommittee in charge of the work on chemical analysis has extended cooperative tests under way for determining free lime and the committee is giving thought to the preparation of quick methods for silica, lime, and magnesia and also direct methods for determining alumina and titanium oxide.

Messrs. Davis, Brown, and Kelly of the University of California in discussing "Some Factors Influencing the Bond Between Concrete and Reinforcing Steel" presented test results showing there is apparently no consistent relationship between bond strength and concrete compressive strength, but which seem to demonstrate that bond strength is largely influenced by the homogeneity of the paste in contact with the bar and by volumetric changes within the paste of the concrete surrounding the bar. Bond strength varies greatly with type of cement; is less at initial slip for a rich concrete than a lean one; is less for horizontal than for vertical bars; is less for round than for square bars placed horizontally; may be greatly increased either by delayed vibration or by jigging during the setting period of the cement; is greatly decreased by repetitions of freezing and thawing or of wetting and drying; is greater for dry concrete than for saturated concrete; and under a variety of conditions is substantially greater for cements ground with TDA than for corresponding untreated cements.

An interesting paper was presented by T. C. Powers of the Portland Cement Assn. on "Measuring Young's Modulus of Elasticity by Means of Sonic Vibrations." The method involves determination of the natural frequency of vibration. In the work reported, the frequency was determined by finding the bar in a set of tuned steel bars which gave the pitch nearest to that of the specimen. The dynamic method, according to the authors, is believed to give the true elastic modulus not complicated by plastic flow.

"The Effect of Using a Blend of Portland and Natural Cement on Physical Properties of Mortar and Concrete" was covered in a paper by Messrs. Kellermann and Runner of the U. S. Bureau of Public Roads. In an effort to combat scaling of pavements due to the use of salts which has occurred in some northern states, a blend of natural and portland cements has been used. The tests indicated that, whereas strength was reduced by replacing a portion of the portland cement with natural cement, resistance to alternate freezing thawing was, for certain combinations of materials, substantially increased.

CERAMIC, MASONRY MATERIALS, LIME, GYPSUM

Six committee reports and three technical papers, two of these being appended to the Report of Committee C-15 on Manufactured Masonry Units, were presented at the session devoted to ceramic and masonry materials and lime and gypsum. Committee C-15 recommended the withdrawal of the Standard Specifications for Building Brick (Made from Clay or Shale) (C 62 – 30) since they are now considered incomplete in that they do not include requirements on the resistance of brick to weathering agents. The replacement specifications (C 62 – 37 T) will continue as tentative—this does include methods for predicting the resistance of clay brick to frost action. New specifications for concrete masonry units for use in construction of catch basins and manholes were reported favorably. These cover the strength and absorption properties and general requirements of such units made from portland cement and suitable aggregates. The new specifications for structural clay load-bearing wall tile which were approved as tentative to replace when adopted as standard the existing specifications (C 34 – 36) incorporate a method of specifying dimensions and shape.

In a paper appended to the report, W. J. Krefeld, Columbia University, discussed the "Effect of Shape of Specimen on the Apparent Compressive Strength of Brick Masonry." Among his conclusions, which are limited to the specimens tested, are that suitable correction factors would permit the use of relatively short piers to be used for determination of the quality of the masonry, but that it is not advisable to adopt a specimen with a ratio of height to thickness of less than 3 or 4 due to the more pronounced influence of shape.

Messrs. J. W. McBurney and A. R. Eberle of the National Bureau of Standards discussed the effect on distintegration of certain selected and comparable samples of brick with certain variations in the methods of freezing-and-thawing test. While the use of whole or half bricks as test specimens did not significantly affect the result of the same method of freezing and thawing, the nature of the brick influences the relative effect of differences in the methods of tests, and gross error may result from attempts to express results of freezing and thawing by one method in terms of results obtained by another method unless samples of the same bricks have been tested by each method.

Committee C-7 on Lime recommended the deletion of the autoclave soundness test from the methods of physical test for limestone, quicklime and hydrated lime. During the coming year the committee plans to continue its investigation of methods for determining soundness. There was included in the annual C-7 report three proposed specifications published for information and comment covering: quicklime for causticizing leached liquors in the soda-pulp process for the manufacture of paper, quicklime for use in the manufacture of paper pulp where the precipitated carbonate is employed as a pigment or filler, and method of determining available lime in high-calcium quicklime and hydrated lime by the rapid sugar test.

Based on rather extensive investigative work, Committee C-11 on Gypsum recommended a number of changes in several of its standards, including the requirements for Keene's cement. This latter provides for the use of a modified vicat needle in place of the present 350-g. needle and also modification in the minimum tensile strength requirement from 450 to 400 lb. per sq. in. Considerable work on the ammonium acetate method of determining the sand content of set gypsum plaster has resulted in development of sufficient data and information on the technique to set the

method up as a tentative revision of the standard methods for testing gypsum and gypsum products.

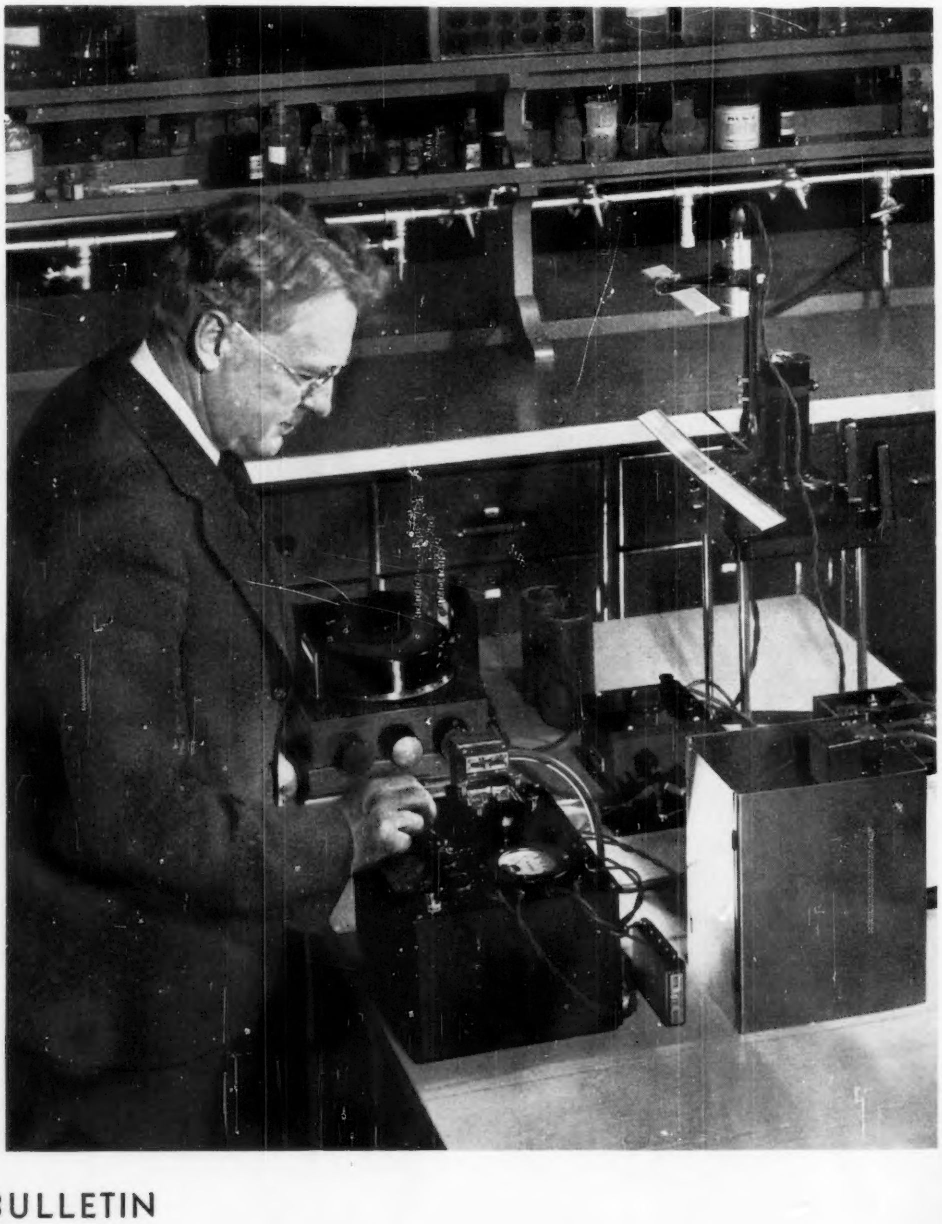
Active work on the part of Committee C-8 on Refractories resulted in the development of two new tentative standards, one covering methods of procedure for measuring the dimensions of refractory brick and tile and warpage of refractory tile, and the other for true specific gravity. Tentative revisions were approved for publication in three specifications covering fire clay brick for malleable furnaces, for stationary boiler service, and for marine boiler service, providing a requirement covering permissible variation in warpage. This indicates that 95 per cent of the shapes shall not show a warpage greater than $\frac{1}{8}$ in. per linear ft. of the diagonal used in making the measurement.

BITUMINOUS MATERIALS, ROAD MATERIALS AND SOILS

Possibly the item provoking most interest at the session devoted to bituminous materials, road materials and soils, was the paper by E. O. Rhodes, Koppers Company, describing "A Machine for Testing Highway Subgrade Soils" and giving some results of tests which have been made. In his introduction Mr. Rhodes pointed out that much remains to be accomplished, both in the field and laboratory, before studies of soil stabilization will have emerged completely from the experimental stage. In the field better construction practices and improved mechanical devices are needed, and in the laboratory better methods of test must be developed or the ability properly to interpret present test results must be realized.

If a machine could be located which would measure the force (traffic) required to manipulate (deform) different soils (roads) in the presence of varying amounts of water (rain), significant and measurable differences might be determined for soils known to have good and bad service behaviors. With such a device it should then be possible to study the effects of different stabilizing agents or to determine the optimum quantity of a given stabilizer for a given soil. Such a machine, called a plastograph, extensively used in the flour milling and baking industries, was described by the author.

A condensed description of the machine is as follows: A small mixer is driven by a synchronous motor which is so



"pH Measurement"

Photograph by J. P. Eldredge, Leeds & Northrup Co., awarded Third Prize in photographic exhibit.

mounted that it is free to rotate. Each resistance which the mixing blades encounter in the material under test asserts itself as a reaction force in the motor casing and tends to rotate the latter in the opposite direction. This turning movement in the motor casing is transmitted to a weighing system and to a recorder by means of a lever system whose oscillations are restricted by a dash-pot. The resistance of the material under test to mechanical force is recorded on a chart as a function of time. By varying the temperature of mixing, by means of a circulating thermostat, resistance to mechanical force at different temperatures may be measured.

Mr. Rhodes concludes from his preliminary studies that the use of the plastograph will enable soil studies to be conducted more intelligently and to predict with greater certainty the behaviors of soils used for highway purposes with or without admixtures of stabilizing agents, and that the plastograph limits define significant soil stages with a high degree of reproducibility.

During the past year the Society's Committee D-4 on Road and Paving Materials completed a number of important standardization projects including consolidation and revision of a number of previously issued specifications. For instance, in the field of tars, eight existing specifications were regrouped and combined, with certain additional grades being added, and reissued as a single standard covering low-consistency, medium-consistency, heavy-consistency, extra-heavy-consistency, and cut-back tars.

A new tentative method of test for sieve analysis of fine and coarse aggregates, prepared jointly by Committee D-4 and C-9 on Concrete and Concrete Aggregates gives in a single method requirements covered previously in four standards. As a result of detailed study of previously issued specifications covering crushed stone and crushed slag, new tentative specifications were issued replacing a number of these.

A new specification covering asphalt mastic for use in waterproofing was approved on the recommendation of Committee D-8 on Bituminous Waterproofing and Roofing Materials and a number of revisions were approved.

Active progress was reported by the Society's Committee D-18 on Soils including revisions in seven of the nine existing test methods to bring these up to date and incorporate certain improved procedures. The committee sponsored two papers: One by Prof. E. E. Bauer, University of Illinois, on "A Study of Flocculating Agents Used in the Particle Size Determination of Soils" and another by Messrs. Hogentogler and Allen of the U. S. Bureau of Public Roads on "The Application of Soil Mechanics." Professor Bauer concluded that sodium silicate which is specified in the A.S.T.M. Methods of Mechanical Analysis of Soils (D 422 – 35 T) is not the best deflocculating agent in the case of many soils. Other conclusions were that the proper amount of deflocculating agent to use varies with different soils; certain soils contain a mineral or minerals that form a gel and when this gel is formed the sedimentation method of determining particle sizes is invalid, and decreasing the concentration of the suspension appears as a possible means of overcoming this effect; for some soils at least the removal of the natural moisture content makes it more difficult to deflocculate the soil; and use of several deflocculating agents in one suspension appears to be an unwise thing to do.

Prof. D. M. Burmister, Columbia University, reported on "The Grading-Density Relations of Granular Materials" and indicated relations which provided means of estimating the influence of grading on density. He pointed out the significant facts that each material can exist in a certain loose condition in its natural state or in some artificial state in embankments, and can be compacted only to a certain dense state by external loadings, vibrations, rolling, shrinkage, etc., with a large or small spread between the loose and dense conditions. In discussing this paper, Prof. I. F. Morrison, University of Alberta, indicated that rigidity of a mass, often called stability, is not solely a matter of density or closeness of packing and that particle shape – density relationships are important even though more difficult to evaluate than particle grading. He expressed a hope that some relationship between the particle shape – density relations might be worked out and their relationship to the rigidity of a granular mass.

FUELS, PETROLEUM PRODUCTS, ELECTRICAL INSULATING MATERIALS

The Committee on Coal and Coke submitted a new method of sampling coals classed according to ash content. This is applicable to ordinary commercial sampling and is designed to have an accuracy such that in 95 cases out of 100, the ash content of the sample will be within plus or minus 10 per cent of the true ash content of the coal sampled. In the proposed method, coals are divided for sampling into four groups, depending on ash content, and each group is subdivided according to size of coal. The minimum size of increments as given is based on the quantity of coal necessary to represent the true size consist of the coal sampled.

A tentative revision was approved for publication in the standard methods of laboratory sampling and analysis providing for a change in the method for determining fusibility of ash to give essential furnace requirements and mention of specific furnaces which the committee has approved. The committee is planning to investigate the plastic properties of coals as affecting their combustion characteristics. In connection with testing the expanding properties of coal during carbonization in coke ovens, arrangements are being made to distribute samples of coal of various ranks to different laboratories for making expansion tests by different methods. Such preliminary cooperative testing is believed necessary in the selection or development of a standard test procedure.

The Committee on Gaseous Fuels submitted a progress report outlining results of considerable investigative work involving such fields as the measurement of gaseous samples where laboratory wet gas meters have been investigated, and determination of calorific value of gaseous fuels where an analysis has been made in the United States and Canada on existing practices followed by the industry for heating value determinations. In order to obtain information on the comparative performance of available equipment for specific gravity determinations, the National Bureau of Standards is preparing synthetic gases of known composition and specific gravity. A proposed referee method for determining sulfur has been prepared and another very accurate method is under consideration. A method of measuring moisture content of fuel gases with conductivity cells has

been investigated and preliminary sensitivity tests are to be made.

The Sectional Committee on Classification of Coals, which functions under A.S.T.M. sponsorship in accordance with the procedure of the American Standards Association, has developed proposed definitions for varieties of bituminous and sub-bituminous coals which were accepted as tentative.

A most difficult problem in connection with mineral transformer oil has been the development of a test for determining suitability of oil for commercial use. F. M. Clark in his paper "Studies in the Oxidation of Mineral Transformer Oil" proposed a test in which the oxidation of the oil is accelerated by the use of oxygen gas at 250 lb. per sq. in. pressure, the test being carried out at 140 C. for a period of 24 hr. Sludge formation under such conditions of oxidation appears to be closely related to the formation of free organic acid bodies formed as a direct oxidation product and to involve no chemical factors not present in the oxidation and sludging of the oil under atmospheric conditions at lower temperature.

A very extensive report outlining important research work and detailing actions on standards was presented by Committee D-9 on Electrical Insulating Materials. Two new tentative methods of test were accepted. One of these involves the testing of solid electrical insulating materials for arc resistance—this method has been found very useful, especially in comparing the arc resistance of different materials. The other covers a method of acetone extraction of phenolic molded or laminated products. Some years ago it was found that uncured bakelite could be reacted upon by acetone, creating a staining of the acetone solution in which the incompletely cured part was immersed. This led many molders to believe that this could be used as a test for curing. However, the work of the committee has demonstrated that it is not reliable but that an acetone extraction could be used as a reliable identification test.

A number of important recommendations submitted by Committee D-2 on Petroleum Products and Lubricants were accepted by the Society, including new tentative standards covering test for acid heat of gasoline, test for unsulfonated residue of plant spray oils and specifications for Stoddard solvent. Tests for determining ash content of petroleum oils and for determining saponification number (this latter is a consolidation of two present methods which are to be withdrawn, namely D 94 – 36 under the sponsorship of Committee D-2, and D 438 – 36 T under the sponsorship of Committee D-9) were approved but since they were not included in the D-2 report they are subject to confirming letter ballot. The acid heat method is suitable for aviation and motor gasolines having Reid vapor pressures of 15 lb. or less. The method is roughly indicative of the amount of unsaturated hydro-carbons in the gasoline that are reactive with sulfuric acid under the conditions of this test. The specifications for Stoddard solvent cover a grade of petroleum distillate of low flammability used in dry cleaning.

Changes which were accepted in the tentative method of test for knock characteristics of motor fuels were essentially an editorial clarification and amplification. Other revisions were made in the tests for vapor pressure of petroleum products (Reid method) and test for kinematic viscosity. Certain standards were revised; and subject to letter ballot of the Society the tentative test for color of refined petroleum oil by means of Saybolt chromometer is to be adopted as standard. Also action was taken to approve the adoption of the existing revision of the standard tests for viscosity by means of the Saybolt viscosimeter.

There is to be published as information a proposed method of test for determining ignition-quality characteristics of diesel fuels and further changes are contemplated in the diesel-fuel-oil classification which was published in the 1937 report.

Of outstanding interest to committee members was a round-table discussion on the present state of knowledge of the oxidation of motor oils and problems resulting from it, including the nomenclature of the products formed. This conference proved to be a constructive contribution to the work of Technical Committee B on Lubricants and the results will form the basis of its future program.

The annual D-2 dinner this year was held in honor of Dr. J. C. Geniesse of The Atlantic Refining Co. who is chairman of Subcommittee V on Viscosity. This honor was in recognition of his valuable contributions as chairman of this subcommittee in the development of methods of test for the determination of kinematic viscosity and conversion tables for converting centistokes to Saybolt seconds.

Messrs. Wright and Mills of the Norma-Hoffman Bearings Corp. described an accelerated test to select and grade lubricating greases for chemical stability. While most of the work reported has been done on typical ball bearing greases of the soda-base type, data are presented showing that accelerated oxidation tests may be expected to provide useful information on lime and aluminum-base greases and on gear greases. This absorption method in principle measures the rate at which oxygen is used up in oxidizing the readily oxidizable constituents in the grease sample. The sample is placed in a pressure-tight steel bomb and the test operated under fixed conditions of temperature, pressure, surface area and weight of grease sample.

SOAP, TEXTILES, PAINT, RUBBER

Four new tentative specifications developed by Committee D-12 on Soaps and Detergents cover white floating toilet soap, chip soap, powdered laundry soap and ordinary laundry bar soap. There were also offered four new tentative methods of test for particle size of soaps and other detergents, determination of combined sodium and potassium oxides in soaps, chemical analysis of sulfonated (sulfated) oils, and chemical analysis of special detergents. The recommendation to adopt as standard the tentative methods of sampling and analyses of soaps and soap products was not accepted pending some clarification of requirements for the apparatus used.

In presenting the report, attention was called to the fact that the specifications developed by the committee provide an equitable basis for payment, this problem having been a source of considerable difficulty in the trade with loss to shippers.

Committee D-13 on Textile Materials presented a voluminous report which indicated considerable activity. Six new tentative standards were presented, including specifications for single-ply bleached cotton broadcloth, bleached wide cotton sheeting and terry (turkish) toweling, and methods of tests for fastness of colored textile fabrics to light, tests

for spun rayon yarns and threads, and yarns spun from wool mixed with fibers other than wool. The three specifications are based on extensive analyses and comparisons made by the Bureau of Home Economics, U. S. Department of Agriculture. The test requirements for yarns spun from wool have been necessitated by the extensive use of this material. A large number of revisions of existing standards and tentative standards were recommended by the committee, some for immediate adoption.

While the committee in its report had recommended the withdrawal of specifications and methods of test for Osnaburg cement sacks, a request from several important sources that these be retained on the books of the Society was acquiesced in by Committee D-13. The attention of the committee having been drawn to the need in the industry for test methods evaluating the effect of finishing agents, a preliminary survey is being conducted to determine the extent of interest among producers and consumers and to develop a program for the investigation of numerous problems involved.

The paper outlining "Progress in Wool Standardization," G. E. Hopkins, Bigelow-Sanford Carpet Co., Inc., is published in this issue of the BULLETIN.

Committee D-17 on Naval Stores, in order to make available in greater detail than now provided by the Regulations of the Naval Stores Act the methods of sampling and grading and tolerances permitted, developed new methods of sampling and grading rosin which were accepted for publication as tentative. The committee plans to continue its work on crystallization to develop a practical method of determining this tendency. Work on methods of determination of petroleum ether insoluble matter and the determination of ash in rosin will be started.

A discussion of the theory underlying crystallization of rosin was given by E. A. Georgi of the Hercules Powder Co. Experiment Station. He pointed out that crystallization does not change the chemical properties of rosin, although it may be annoying to the user to find that rosin just put in the solution is crystallizing out. It was stated that while rosin is often considered as being a solid, in its usual state it is merely a supercooled liquid, and that rosin can be assumed to be a "glass" when considered as a supercooled impure compound. From the theoretical standpoint, crystallization can be prevented by the addition of a material so strongly absorbed that the crystal nuclei cannot form. Substances which are only moderately absorbed cause a change in crystal form only.

A most interesting paper was presented in this session by A. E. Schuh, Bell Telephone Laboratories, Inc., dealing with "Adherence of Organic Coatings to Metals." He pointed out that adherence losses are in most cases the result of a prolonged tug-of-war with a large number of competing forces and only in rare cases can a single simple cause explain a given case. Usually it is attributable to complicated causes which frequently are not related to the initial strength of adhesional bond. The coating material may have degraded to such a point of weakness and brittleness that a slight impact or other external stress causes it to fall off. In other instances, a new and weakly-coherent interface may have developed as the result of high moisture permeability and thus destroyed the adherence of the finish. Finally, with thick coatings, sufficient internal stresses may have developed in certain coatings that even the best adhesional bond is overcome and as a result poor adherence of the finish produced.

In his discussion F. N. Speller, National Tube Co., pointed out that the problem of metal preparation is now considered more important relatively than the kind of paint applied and is receiving more attention. Since the surface formed by metal films is one that usually has to be taken into consideration, it was fortunate that much is known about surface films mainly from work done on corrosion, and in many cases they can be formed so well as to improve paint adherence materially.

Committee D-11 on Rubber Products submitted a number of important recommendations including new tentative methods of testing flat rubber belting. These amplify and replace the existing standard methods D 378 – 36. In the new standard test procedures are given for all flat types. A change in the methods of testing rubber hose (D 380 – 37 T) was approved in the method of testing thickness of a rubber element. This standard requires that a standard micrometer shall be used, but in the case of fire hose, it is not customary to use this instrument. Because a change in the methods of testing fire hose might necessitate revision of purchase specifications used by a wide diversity of interest, the committee is modifying the Tentative Methods D 380 providing a special procedure now in use for fire hose.

Two of the tentative specifications were recommended for adoption as standard covering friction tape and rubber insulating tape. While the requirements for friction tape may not be entirely satisfactory in some special applications, for instance, in railroad signal work where greater adhesion than the required minimum is often specified, the committee believes that the present specifications satisfactorily cover, as intended, a tape "for general use for electrical purposes" and prefers to consider issuing separate specifications for special services, as required.

Several new tentative standards were accepted on the recommendation of Committee D-1 on Paint, Varnish, Lacquer, and Related Products including specifications for aluminum pigment paste for paint, c. p. para red toner, c. p. zinc yellow (zinc chromate), titanium dioxide pigments, and zinc sulfide pigments. New methods of sampling and testing aluminum powder and aluminum paste (concurrent with this there was the withdrawal of the standard method of test for determination of polishing lubricant in aluminum powder for paints (aluminum bronze powder) (D 306 – 31)) and a new method of test for reactivity of paint liquids were also accepted for publication.

An important change was made in the report of the committee involving the withdrawal of the proposed specifications for interior flat paint. A number of criticisms of the specifications were received and the committee wishes to give further consideration to these before making a definite recommendation to the Society.

At a meeting of Committee D-1 held during the annual meeting a new subcommittee, XXIX on Painting of Structural Iron and Steel, made its first report, outlining a program of study to be conducted during the coming year. Committee D-1 approved a plan to sponsor a Symposium on Testing at the 1939 annual meeting of the Society which is to be held at Atlantic City. At the conclusion of the committee meeting, a paper on "Gloss—Its Definition and

Method of Test" was presented by Dr. D. B. Judd of the National Bureau of Standards.

WATER

Steadily growing interest in connection with water for industrial uses resulted in a complete session being devoted to this subject. Committee D-19 presented seven proposed methods, the first covering the sampling of plant or confined waters for industrial uses. It is designed to furnish general technical information for securing representative samples of water for analysis. Other methods cover the determination of the calcium ion and magnesium ion, chloride ion, total carbon dioxide and calculation of carbonate and bicarbonate ions, hydroxide ion, total orthophosphate and calculations of the respective orthophosphate ions and sulfate ion in industrial water. The publication of these methods is making available to industry standardized procedures which have been urgently needed.

An indirect method for the estimation of sodium in water supplies was described by Messrs. Romer, Cerna and Hannum of the Babcock & Wilcox Co. The method is based on the principle that all inorganic basic ions present in the solids obtained on evaporating the water sample to dryness are converted, by controlled fuming with sulfuric acid, to either sulfates or oxides. With the exception of sodium, potassium, and lithium, all of the anions present after this treatment can be readily and accurately determined by standard quantitative methods. With the above data available it is possible to estimate, by simple calculations, the amount of sodium present. A series of samples was prepared by dissolving in distilled water various amounts of those compounds common to industrial waters. These samples were analyzed and the results show that sodium is quite accurately determined by this method. R. T. Sheen in discussing the paper stated that the excellent results obtained by the authors showed this method to be dependable and it should possibly be considered as a method for the sum of sodium and potassium in raw or natural waters.

P. G. Bird, National Aluminate Corp., discussed the newer organic types of exchanger bodies as applied to water treatment for the complete or partial removal of dissolved salts, this use of exchange filters being a relatively new practice. To effect practically complete removal of dissolved salts from water, the water is passed through two filter beds arranged in series. The first bed, known as the "cation exchanger bed," removes the positive ions, or cations such as those of calcium, magnesium, and sodium. The second bed removes the negative ions, or anions, such as the chlorides, sulfates, and nitrates and is referred to as an "anion exchanger bed."

Messrs. Straub and Bradbury of the University of Illinois, described a method for the embrittlement testing of boiler waters. The authors concluded that for steam pressures up to 250 lb. per sq. in. embrittlement may be prevented by maintaining the sodium-chloride content of the boiler water greater than 0.6 times the total alkalinity expressed as sodium carbonate along with the sodium sulfate content greater than 1.0 times the total alkalinity. For steam pressures between 500 and 1400 lb. per sq. in., these results would indicate that the presence of a soluble R_2O_3 content of greater than 0.6 times the $Si\ O_2$ content of the boiler water prevents embrittlement. For a steam pressure of 350 lb. per sq. in., the sulfate and chloride to akalinity ratios appear to be effective in preventing embrittlement, although larger amounts may be necessary than at the lower pressures.

J. B. Romer in discussing the paper pointed out that the test unit has a feature which ties it in with actual boiler experience to a greater degree than any previous test equipment, this being the small annulus, or capillary space between the test specimen and the filler bar, and the even smaller capillary space at the top of this filler. Although the authors use boiler waters or solutions of comparable concentrations, they are able to concentrate these solutions in this capillary space in a manner distinctly analogous to the action within the seams of a boiler. This is a feature never heretofore obtained simultaneously with the control of temperature and pressure, he said.

Foreign Standards Recently Issued

STANDARDS issued by a number of engineering and technical organizations in foreign countries are received by the Society as they are adopted. Since members of the Society may be interested in knowing that such standards are available they will be listed as received.

Recently the following standards have been issued by the Standards Association of Australia:

AUSTRALIAN STANDARD SPECIFICATIONS FOR:

- Railway Permanent Way Materials (No. E 22 to E 29 – 1938)
- Carbon Steel Plates for General Engineering Purposes (No. A. 33 – 1937)
- Carbon Steel Plates for Boilers (No. B. 58 – 1937)
- Galvanized (zinc-coated) Hexagonal Mesh Steel Wire Netting (No. N. 2 – 1938)
- Concrete Drainage Pipes—Precast (No. A. 35 – 1937)

AUSTRALIAN COMMERCIAL STANDARD SPECIFICATIONS FOR:

- Towels and Towelling for Hospitals and Kindred Institutions (No. 10 – Part 1 – Section 7)

BRITISH STANDARD SPECIFICATIONS FOR:

- Iron or Steel Tubular Poles for Telegraph and Telephone Purposes (C.E. (EL) 6356)
- Under-Floor Steel Ducts for Electrical Services with Fittings (No. 774 – 1938)
- Tungsten Filament Electric Lamps, and Fittings, with Partial Daylight-Colour Correction (No. 793 – 1938)
- Sampling of Coal Tar and Its Products (No. 616 – 1938)
- Long Length Moulded Rubber Hose with Cotton Braided Reinforcement (No. 796 – 1938)
- Bomb Calorimeter Thermometers (No. 791 – 1938)
- Galvanized Corrugated Steel Sheets (Primarily for Use in the Home Market) (No. 798 – 1938)
- Lead and Lead Alloys for Cable Sheathing (Suitable for All Types of Metal Sheathed Cable) (No. 801 – 1938)
- One-Mark Capillary Pipettes (No. 797 – 1938)
- Round Strand Steel Wire Ropes for Cranes (Revised May, 1938) (No. 302 – 1938)
- Solid Bituminous Filling Compounds for Cable Boxes on Systems up to and Including 11,000 Volts (No. 803 – 1938)
- Steel for Die Blocks for Drop Forging (Revised May, 1938) (No. 224 – 1938)
- Tarmacadam Part 1.—Tarmacadam (Granite, Limestone, and Slag Aggregate). Part 2.—The Surfacing of Roads with Tarmacadam (No. 802 – 1938)

NEW ZEALAND STANDARD SPECIFICATION FOR:

- Galvanized (zinc-coated) Steel Fencing Wire (N.Z.S.S. 143)

Round Table on the Nature of Hardness

THERE has been organized by the Physics of Metals Committee of the A.I.M.E., with other cooperating groups, a Round Table Discussion of the Nature of Hardness to be held on the evening of October 19 during the annual meeting of the American Society for Metals in Detroit. Dr. J. T. Norton, Massachusetts Institute of Technology, is Chairman of the Physics of Metals Committee. The chairman of the meeting will be Prof. D. E. Ackerman, Purdue University. Discussion will be based on seven topics as follows:

1. Mechanical and Metallurgical Aspects of Hardness—S. L. Hoyt, Chief Metallurgist, A. O. Smith Corp.
2. Work Expended in Indentation Hardness Tests—J. J. Kanter, Research Metallurgist, Crane Co.
3. Physical Quantities Relative to Interatomic Forces (Hardness)—E. U. Condon, Associate Director of Research, Westinghouse Electric and Manufacturing Co.
4. Relation of Compressibility to Hardness—H. W. Russell, Physicist, Battelle Memorial Institute.
5. Relation of Plastic Behavior to Hardness—R. H. Heyer, Research Metallurgist, American Rolling Mill Co.
6. Plastic Deformation of Metallic Single Crystals as Related to Hardness—M. Gensamer, Dept. of Metallurgy, Carnegie Institute of Technology.
7. Quantum Mechanical View of the Interatomic Forces Relative to Hardness—Saul Dushman, Associate Director of Research, General Electric Co.

Transactions of Power Conference and Congress on Large Dams

THERE has just been received an extensive prospectus outlining the Transactions of the Third World Power Conference and of the Second Congress on Large Dams, these meetings having been held concurrently in Washington in September, 1936, under the auspices of the United States Government. The Transactions of the Third World Power Conference, comprising approximately 7500 pages, are published in ten volumes. A charge of $22 for each complete set has been fixed. The Transactions of the Second Congress on Large Dams will comprise some 2500 pages, being issued in five volumes at a cost of $10 per set.

While the majority of the papers and reports in both Transactions are to be in English, each paper has a summary in the four languages used, namely, English, French, German and Spanish. Abstracts of the oral discussions are given in the speaker's language, being summarized in the other three languages and there are included "general reports" reviewing all the papers which are printed, these reports being printed in four languages. Further details of these extensive volumes which are to be published by the U. S. Government Printing Office can be obtained by writing the Superintendent of Documents, Government Printing Office, Washington, or the American National Committee, World Power Conference, Interior Building, Washington. Those responsible for the publications are desirous that orders be received as promptly as possible, since only one printing of the books is planned and the edition must be determined by the demands for the books.

The World Power Conference is a federation of national committees which was organized in 1924 with the primary purpose of providing a medium of the discussion of the problems — technical, economic, administrative — which every country must meet in the utilization of its power resources, and in supplying its people and its industries with light, heat and power.

Calendar of Society Meetings

(Arranged in Chronological Order)

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Pacific Coast Convention, August 9-12, Portland; Winter Convention, January 23-27, 1939, New York City.

AMERICAN WATER WORKS ASSOCIATION—Central States Section, August, 17-19, Hotel Windsor, Wheeling, W. Va.

AMERICAN TRANSIT ASSOCIATION—57th Annual Convention, September 19-22, Atlantic City Auditorium, Atlantic City, N. J.

AMERICAN SOCIETY FOR METALS, National Metal Congress, October 17-22, Detroit, Mich.

HIGHWAY RESEARCH BOARD—National Research Council, 18th Annual Meeting, November 20 to December 2, 2101 Constitution Ave., Washington, D. C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual Meeting, December 5-9, New York City.

SOCIETY OF AUTOMOTIVE ENGINEERS—Annual Meeting and Engineering Display, January 9-13, 1939, Detroit, Mich.

Folders and Literature Received

TINIUS OLSEN TESTING MACHINE CO., 500 N. Twelfth St., Philadelphia, Pa. Hardness Testing Equipment, Bulletin No. 61. A 56-page publication in heavy paper cover describing a wide range of hardness testing machines including Brinell, Ballentine, Firth, and others, for use in testing a large number of materials—both metallic and nonmetallic.

Static and Dynamic Balancing Machines, Bulletin No. 14. A 24-page booklet covering vibro-electric, static-dynamic, balancing machines. Covers equipment for balancing in one operation high-speed rotating parts where an accurate balance is necessary.

W. & L. E. GURLEY, 514 Fulton St., Troy, N. Y. Bulletin No. 1500 covering Gurley precision standards of length, mass and volume and equipment for sealers of weights and measures. A 36-page booklet covering a wide range of equipment under the subject indicated.

Bulletin 1420 covering Gurley paper testing instruments. Includes smoothness and stiffness testers, porosity tester, densometer, timing equipment, and the like. 16 pages.

Bulletin No. 1490 covering Gurley-Hill S-P-S tester. Tests the printing quality of paper, measuring its softness, porosity, and smoothness. 4 pages.

PRECISION SCIENTIFIC CO., 1750 N. Springfield Ave., Chicago, Ill. Bulletin No. 221, 20 pages, covering apparatus for testing cement, concrete, lime, gypsum and soils; the equipment conforms to A.S.T.M. and A.A.S.H.O. requirements. Also gives information on sieves and screens.

Bulletin No. 222, 6 pages. Shows U. S. standard sieves and other types of sieves and screens for grading sands, stones and soils.

WESTON ELECTRICAL INSTRUMENT CORP., 614 Frelinghuysen Ave., Newark, N. J. Pamphlets describing all-metal Western laboratory thermometers and industrial temperature gages.

AMERICAN INSTRUMENT CO., 8010-8020 Georgia Ave., Silver Spring, Md. Bulletin 1070 covering the Aminco-Brenner Magne-Gage for measuring the thickness of coatings on metals.

CENTRAL SCIENTIFIC CO., 1700 Irving Park Blvd., Chicago, Ill. General Catalog, J-136, of Laboratory Apparatus and Scientific Instruments, for physics, chemistry, biological sciences and industrial testing. A voluminous (1660 pages) publication describing the wide range of equipment furnished by this company. The catalog is sectionalized under balances and weights; chemical apparatus; chemicals; analytical and industrial testing; bacteriology, pathology, clinical testing; physical chemistry and chemical physics; physics; tools and raw materials; blowers and vacuum pumps; constant temperature apparatus and devices. A detailed index covers some 64 pages, and includes quite an extensive list of A.S.T.M. tests and specifications for which apparatus are listed in the catalog, also A.A.S.H.O. tests.

RIEHLE TESTING MACHINE DIVISION, AMERICAN MACHINE AND METALS, INC., 100 Sixth Ave., New York City. New pamphlet on the Riehle Precision Combination Impact Tester for Izod, Charpy and Tension Impact testing. 4 pages.

SCIENTIFIC GLASS APPARATUS CO., Bloomfield, N. J. A 260-page catalog of glass apparatus for the chemical laboratory—200 pages of apparatus equipped with interchangeable ground glass joints—20 pages of apparatus with the new patented Metal Clad Joints—40 pages devoted to micro-chemical glassware. Each section is cross-indexed in order to simplify references to complementary parts. A detailed index is included. Copies of this new catalog, just off press, may be obtained by writing to the company.

NEW MEMBERS TO JULY 12, 1938

The following 63 members were elected from April 27 to July 12, 1938, making the total membership 4172:

Company Members (9)

CRETEX COS., INC., THE, D. W. Longfellow, Secretary-Treasurer, First National Bank Building, Elk River, Minn.

EHRET MAGNESIA MANUFACTURING CO., H. G. Hill, Engineer, Room 1609, 225 Broadway, New York City.

GULICK-HENDERSON CO., INC., M. C. Wylie, Secretary, 524 Fourth Ave., Pittsburgh, Pa.

HOLLUP CORP., R. E. Long, Chief Engineer, 3357 W. Forty-seventh Place, Chicago, Ill.

KAHN, INC., ALBERT, Albert Kahn, 345 New Center Building, Detroit, Mich.

LAVIN AND SONS, INC., R., Benjamin Lavin, Secretary, 3426 S. Kedzie Ave., Chicago, Ill.

MERRY BROTHERS BRICK AND TILE CO., G. H. Merry, Secretary, 401 Marion Building, Augusta, Ga.

SOCIETÀ METALLURGICA ITALIANA, Casella Postale 3396, Via Leopardi 18, Milan 3/43, Italy.

SUPREME LABORATORY, D. N. Hoffman, Chief Chemist, 667 Garfield Ave., Jersey City, N. J.

Individual and Other Members (53)

ALABAMA CHEMICAL LABORATORY, STATE DEPARTMENT OF AGRICULTURE AND INDUSTRIES, E. K. Tucker, Chemist, 512 Monroe St., Montgomery, Ala.

BARTON, J. FRANK, Chief Chemist, The Federal Portland Cement Co., Inc., Buffalo, N. Y. For mail: 272 Maple Ave., Hamburg, N. Y.

BENARD, FREDERIC, Plant Manager, Ontario Refining Co., Ltd., Copper Cliff, Ont., Canada.

BICKEL, H. H., Chief Engineer, The Wickes Boiler Co., Saginaw, Mich.

BRODRICK, E. J., Assistant Director of Purchase, Department of Purchase, 1928 Municipal Building, New York City.

BUCHHOLTZ, HERBERT, Director, Mannesmannröhren - Werke Abt. Forschungsinstitut, Duisburg-Wanheim, Germany.

CARY, P. E., Testing Engineer, International Harvester Co., Chicago, Ill. For mail: 12020 Stewart Ave., Chicago, Ill.

CHASE, F. L., Chief Chemist, Material Testing Laboratories, Frigidaire Division, General Motors Corp., Dayton, Ohio.

CHRISTIE, J. L., Assistant to Vice-President, Handy & Harman, Bridge-Port, Conn.

DAXON, B. P., Construction Engineer, State Board of Control, Lincoln, Nebr. For mail: Ingleside, Nebr.

DOAN, G. E., Professor of Physical Metallurgy, Lehigh University, Bethlehem, Pa.

DONLEVY, F. I., Metallurgist, Caterpillar Tractor Co., San Leandro, Calif.

DUNHAM, L. H., District Metallurgist, American Steel and Wire Co., 208 S. La Salle St., Chicago, Ill.

FRENCH, H. J., In Charge, Alloy Steel and Iron Development, The International Nickel Co., Inc., 67 Wall St., New York City.

GIBSON, O. M., Director of Research, G. S. Rogers and Co., 2010 Builders Building, 228 N. La Salle St., Chicago, Ill.

HARDESTY, SHORTRIDGE, Consulting Engineer, Waddell & Hardesty, 142 Maiden Lane, New York City.

HARTKOPF, ARTHUR, Manager, Brabender Corp., 122 E. Twenty-fifth St., New York City.

HERNDON, L. KERMIT, Instructor, Chemical Engineering Dept., Ohio State University, Columbus, Ohio.

HOLT, W. P., Laboratory Manager and Research Director, Eagle & Phenix Mills, Columbus, Ga. For mail: 312 Tenth St., Columbus, Ga.

HYBINETTE, SVEN, President, The Nicralumin Co., 146 W. Cortland St., Jackson, Mich.

JUDD, D. B., Physicist, National Bureau of Standards, Washington, D. C.

KAHN, N. A., Metallurgist, U. S. Navy Yard, Brooklyn, N. Y. For mail: 3832 Nautilus Ave., Brooklyn, N. Y.

KNAPP, C. A. H., Metallurgist, Jenkins Brothers, 510 Main St., Bridgeport, Conn.

LOVELAND, R. P., Head, Photomicrography Dept., Kodak Research Laboratories, Eastman Kodak Co., Kodak Park, Rochester, N. Y.

MACTAGGART, I., Chief Chemist, Kandos Cement Co., Ltd., Kandos, N. S. W., Australia.

MCNULTY, J. D., Vice-President and Treasurer, McNulty Brothers Co., 1028 W. Van Buren St., Chicago, Ill.

MEYER, ADOLPHE, Managing Director and Engineer-in-Chief, Brown, Boveri and Co., Ltd., Baden, Switzerland.

MILLER, F. L., Assistant Director, Esso Laboratories, Standard Oil Development Co., Box 243, Elizabeth, N. J.

MOORE, H. H., Mechanical Engineer, Naval Ordnance Laboratory, Navy Yard, Washington, D. C. For mail: 718 Rock Creek Church Road, Washington, D. C.

MORSE, W. G., Purchasing Agent, Harvard University, Lehman Hall, Cambridge, Mass.

NEIMAN, J. B., General Manager, Detroit Plant, Federated Metals Division, American Smelting and Refining Co., 11630 Russell St., Detroit, Mich.

QUEBEC BUREAU OF MINES, Maurice Archambault, Chemical Engineer, Parliament Buildings, Quebec, P. Q., Canada.

RANDALL, W. H., Chief Engineer, Keyes Fibre Co., Waterville, Me.

RIO GRANDE DO SUL, DEPARTAMENTO AUTÔNOMO DE ESTRADAS DE RODAGEM, José Baptista Pereira, Director Engenheira, Rio Grande do Sul, Brazil.

SAWTELL, H. D., General Works Manager, Richard Johnson and Nephew, Ltd., Bradford Iron Works, Forge Lane, Manchester, England.

SCHERER, G. F., Director of Research, Merco Nordstrom Valve Co., 2431 Peralta St., Oakland, Calif.

SCHURECHT, H. G., Head, Ceramic Experiment Station, New York State College of Ceramics, Alfred, N. Y. For mail: 154 N. Main St., Alfred, N. Y.

SCIENCE MUSEUM LIBRARY, THE, Library Accessions Dept., South Kensington, London, S. W. 7, England.

SEGAL, DAVID, Sales and Development Engineer, Eberbach and Son Co., Ann Arbor, Mich. For mail: 1721 Calvert Ave., Detroit, Mich.

SHEPPARD, G. W., Supervising Engineer, Ocean Accident and Guarantee Corp., New York City. For mail: 1431 Union Trust Building, Cleveland, Ohio.

SIEBEL, E. A., President, E. A. Siebel and Co., 8 S. Dearborn St., Chicago, Ill.

SMITH, G. WEBER, Magnetic Testing Engineer, Vandergrift Works, Carnegie-Illinois Steel Corp., Vandergrift, Pa. For mail: 109 Walnut St., Vandergrift, Pa.

SMITH, HAROLD DEWITT, Treasurer, The A. M. Tenney Associates, New York City. For mail: 47 E. Eighty-eighth St., New York City.

SNYDER, P. M., Metallurgical Engineer, Climax Molybdenum Co., 1101 First National Bank Building, Canton, Ohio.

SOCIÉTÉ NATIONALE DES CHEMINS DE FER FRANÇAIS, Jacques Bancelin, Chef des Laboratoires, 122 Rue Jean Jaures, Levallois, Seine, France.

STUART, H. W., Assistant Director of Research, United States Pipe and Foundry Co., Burlington, N. J.

TAUBER, S. P., President, Rubber Associates, Inc., 1790 Broadway, New York City.

TRIECE, G. H., Materials Engineer, Maryland State Roads Commission, Federal Reserve Bank Building, Baltimore, Md.

TRIPLETT, T. A., Senior Partner, Triplett & Barton, Box 517, Burbank, Calif.

UNIVERSIDAD NACIONAL DE BOGOTA, INSTITUTO DE ENSAYES Y MEDIDAS NORMALES, Julio Carrizosa, Igneniero Civil, Ensayo de Materiales de Construccion, Apartado 1537, Bogota, Colombia.

UNIVERSIDAD NACIONAL DE LA PLATA, FACULTAD DE CIENCIAS FISICOMATEMATICAS, 47 Esquina 1, La Plata, Argentina.

WAITE, FREDERICK, Chief Chemist, Stebbins Engineering and Manufacturing Co., Watertown, N. Y.

YOUNG, V. C., Chief Engineer, Wilcox-Rich Division, Eaton Manufacturing Co., 9771 French Road, Detroit, Mich.

Junior Member (1)

ERICHSEN, G. W., Chemist, J. S. G. Shotwell, Chemical Engineers and Analysts, 92 Slater St., Ottawa, Ont., Canada.

PERSONALS . . . News items concerning the activities of our members will be welcomed for inclusion in this column.

GUSTAV EGLOFF, Technical Director, Universal Oil Products Co., received the honorary degree of Doctor of Science from the Brooklyn Polytechnic Institute on June 15.

W. A. IRVIN, Vice-Chairman of the Board, United States Steel Corp., has been elected president of the Pennsylvania Society of New York.

C. F. HIRSHFELD, Chief of Research Dept., The Detroit Edison Co., has been awarded the honorary degree of Doctor of Engineering by the University of Detroit.

R. F. MEHL, Director, Metals Research Laboratory, and Head, Department of Metallurgy, Carnegie Institute of Technology, has been awarded the honorary degree of Doctor of Science by Franklin and Marshall College.

H. W. GILLETT, Metallurgist, Battelle Memorial Institute, Columbus, Ohio, has been chosen to deliver the 1939 Howe Memorial Lecture of the American Institute of Mining and Metallurgical Engineers.

EPHREM VIENS, Director, Testing Laboratories, Department of Public Works, Ottawa, Canada, has been elected a member of the Council of the Engineering Institute of Canada, representing the Ottawa Branch.

J. C. BEST is now Vice-President, National Gypsum Co., Buffalo, N. Y. He was formerly connected with The Best Bros. Keene's Cement Co., Chicago, Ill.

A. L. DAVIS, formerly Research Engineer, Scovill Manufacturing Co., Waterbury, Conn., is now Treasurer, Bennett Metal Treating Co.

H. P. HAYDEN, who was Assistant to Director, Technical Bureau, Barber Asphalt Corp., Barber, N. J., is now consulting asphalt technologist, 11 W. Forty-second St., New York City.

FITZHUGH TAYLOR has retired from his position as Protection Engineer, Underwriters' Laboratories, Inc., Chicago, Ill.

E. C. LATHROP has resigned as Technical Director of the Crown Zellerbach Corp. to become Vice-President of the Celotex Corp., Chicago, Ill. Doctor Lathrop was for many years Director of Research and Development with the Celotex Corp.

W. W. HORNER is now Professor of Municipal and Sanitary Engineering, Washington University, St. Louis, Mo. He is continuing his consulting engineering service.

O. C. CROMWELL, for many years Assistant to Chief of Motive Power and Equipment, Baltimore & Ohio Railroad, Baltimore, Md., has retired from active service.

H. W. DURHAM, formerly Civil Engineer, Sandwich, Mass., is now Civil Engineer, New York World's Fair 1939, Inc., New York City.

H. S. KARCH is now Technical Superintendent, Martin-Custom-made Tires Corp., Salem, Ohio. He was connected with the Lima Cord Sole and Heel Co., Lima, Ohio, as Chief Chemist.

E. L. LASIER is Consulting Engineer and Head, Materials Branch, U. S. Maritime Commission, Washington, D. C.

F. D. KLEIN, JR., is now Director of Technical Sales, The Schaefer Varnish Co., Louisville, Ky.

H. J. GOUGH, who was formerly Superintendent, Engineering Dept., National Physical Laboratory, Teddington, Middlesex, England, is now Director of Scientific Research, War Office, London, England.

J. STROTHER MILLER, formerly Director of the Technical Bureau of the Barber Asphalt Corp., was advanced to Technical Adviser of the Corporation as of June 1, 1938. He will remain at Barber, N. J., where their major plants are located.

R. R. K. BERNHARD, Engineer and Consultant, Baldwin-Southwark Corp., Philadelphia, has been appointed Professor and Head of the Department of Mechanics and Materials of Construction at Pennsylvania State College.

E. L. WOOD is now Metallurgist, Ordnance Dept., Springfield Armory, Springfield, Mass. He was Engineer, Landers, Frary & Clark, New Britain, Conn.

F. P. VEITCH, Principal Chemist in Charge Naval Stores Research Division, Bureau of Chemistry and Soils, U. S. Department of Agriculture, Washington, D. C., has retired in accordance with the Government's automatic retirement act, after almost 40 years of service.

R. M. PALMER, President, Ferro-Nil Corp., New York City, has been re-elected President of the Alumni Association of the Graduate Schools of Columbia University.

R. H. LEACH, formerly Manager of the Bridgeport Plant, and Director of Research, Handy & Harman, is now Vice-President, In Charge of Production and Research, for the same company.

J. L. CHRISTIE, formerly Chief Metallurgist, Bridgeport Brass Co., is now connected with the firm of Handy & Harman, as Assistant to the Vice-President.

L. T. WORK, Assistant Professor of Chemical Engineering, Columbia University, New York City, was recently elected Vice-Chairman of the American Section of the Society of Chemical Industry for the year 1938 – 1939.

R. B. HARPER, Vice-President, The Peoples Gas Light & Coke Co., Chicago, Ill., has been honored by the Franklin Institute, receiving the Walton Clark Medal, which is presented to the "author of the most notable advance in knowledge or improvement in apparatus, or in method concerning the science of the art of gas manufacture or distribution or utilization in the production of illumination, or of heat or of power."

F. W. HOBBS, President, Arlington Mills, Boston, Mass., has been reappointed to the Board of Direction of the Textile Foundation by President Roosevelt for another four-year term.

R. A. GEZELIUS, formerly Associate Metallurgist, Naval Research Laboratory, Washington, D. C., has become Metallurgist, Taylor-Wharton Iron and Steel Co., High Bridge, N. J.

F. B. JEWETT, President, Bell Telephone Laboratories, Inc., and Vice-President, American Telephone and Telegraph Co., was recently presented with The Washington Award for 1938. This award is administred by the Western Society of Engineers on recommendation of a commission representing four other societies.

C. A. ADAMS, Professor of Engineering, Emeritus, Harvard University, Cambridge, Mass., and Consulting Engineer, Edward G. Budd Manufacturing Co., Philadelphia, and A. C. FIELDNER, Chief, Technologic Branch, U. S. Bureau of Mines, Washington, D. C., were appointed to the advisory committee of the Thirteenth Exposition of Power and Mechanical Engineering to be held at Grand Central Palace, New York City, December 5 to 10.

At the recent annual meeting of the Electrochemical Society, L. R. WESTBROOK, Director, Experimental Laboratory, Grasselli Chemicals Dept., E. I. du Pont de Nemours and Co., Inc., Cleveland, O., and S. SKOWRONSKI, Research Engineer, Raritan Copper Works, International Smelting and Refining Co., Perth Amboy, N. J., were elected vice-presidents for the term 1938 – 1939.

R. J. MOORE, Development Manager, Varnish-Resin Division, Bakelite Corp., has been elected president of the American Institute of Chemists.

H. F. GONNERMAN, Manager, Research Laboratory, Portland Cement Assn., has been elected a Director of the Chemical and Metallurgical Engineering Section of the Western Society of Engineers.

J. R. FREEMAN, JR., has been appointed Technical Manager, The American Brass Co., to succeed the late H. C. Jennison.

NECROLOGY

We announce with regret the death of the following members and representative:

H. G. BALCOM, Consulting Engineer, New York City. Member since 1920.

LAWRENCE GALBRAITH, Lecturer in Civil Engineering, University of Melbourne, Carlton, N. 3, Victoria, Australia.

H. C. JENNISON, Technical Manager, The American Brass Co., Waterbury, Conn. Mr. Jennison had been connected with his company since 1900, occupying several positions until in 1923 he became Technical Superintendent. In 1934, on the death of W. H. Bassett, with whom Mr. Jennison was closely associated since 1923, he became Technical Manager. A member of the Society since 1909, he represented his company on several A.S.T.M. committees, including B-1 on Copper and Copper Alloy Wires for Electrical Conductors, B-2 on Non-Ferrous Metals and Alloys, B-5 on Copper and Copper Alloys and represented the Society on the Joint Committee on Trolley Wire Specifications (Acting Chairman) and on the Non-Ferrous Metals Division of the S.A.E. He was chairman of B-2's Subcommittee on Refined Copper.

F. G. LEIGHTON, Chief Engineer, University of Chile, Laboratory for Testing Materials, Santiago, Chile. Mr. Leighton represented the University of Chile in its Society membership for many years.

JOSEPH B. STRAUSS, President and Chief Engineer, Strauss Engineering Corp., Chicago, Ill. Member since 1919.

L. J. TAVENER, U. S. Representative, International Tin Research and Development Council, New York City. Member since 1932. Mr. Tavener was a member of Committee B-2 on Non-Ferrous Metals and Alloys and three of its subcommittees.

R. E. HAYLETT, Director of Manufacturing, Union Oil Co., Long Beach, Calif. While for the past three years Mr. Haylett had not been active in Society work, he had for the period 1918 to 1935 represented his company in the Society membership. He had been a member of Committee D-2 on Petroleum Products and Lubricants and several of its subcommittees and technical committees since 1922 and had served as a member of the Southern California District Committee. In 1937 he was elected chairman of the Central Committee on Refinery Technology of the American Petroleum Institute. Mr. Haylett had been director of manufacturing of his company for a number of years and was recently elected to the Board of Directors.

PROFESSIONAL CARDS

Professional Cards will be accepted for inclusion on this page from Consulting Engineers, Metallurgists, Chemists, Testing Engineers and Testing Laboratories

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